

AVIATION WEEK

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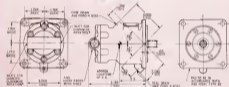


TARGET: SUBMERGED SUB The protecting cloaks of night, foul weather, and ocean are stripped from a submarine by the detection gear and skill of an S2F Navy crew. Pinpointed, the sub is sent to a point of no return—the bottom of the sea. All this equipment required a two plane hunter-killer team until Grumman packaged it into a single aircraft. Grumman S2F's are now operational with the Navy.

GRUMMAN AIRCRAFT ENGINEERING CORPORATION BETHPAGE • LONG ISLAND • NEW YORK

Designers and builders also of the supersonic Tiger, Cougar II, Albatross amphibian, metal boats, and Aerobilt truck bodies

First in Constant Speed Drives...



NEW Sundstrand Aircraft Hydraulic Motors

Sundstrand Aviation announces a new line of Aircraft Hydraulic Motors having unusually high Hp/Wt ratio combined with long life at continuous duty.

Typical of this new line is the model illustrated, which has a displacement of 6.6 cubic inches. While it has a continuous duty rating of 25 hp at 6000 rpm at 1600 psi, it weighs only 5 1/2 lb. Send for Bulletin L-1 for more information about this and other models of the new line. Your inquiry shows special interest and courtesy is assured.

High Hp/Wt ratio

1. Few component parts for maximum reliability
2. Small envelope
3. High operating speeds
4. Capable of continuous operation at 5000 psi at rated speed
5. High overload capacity—admits intermittent overloads to 5000 psi
6. High torque to inertia ratio for rapid cycling or rapid starting
7. Dynamically balanced
8. Operating temperatures of -65° to 275° F

SUNDSTRAND AVIATION

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CONSTANT SPEED DRIVES • AIRCRAFT ACCESSORIES

RESEARCH REPORT

B.F. Goodrich

FIRST IN RUBBER



Every time Northwest's new 1049-G's land, stop, get up and go— they rely on B. F. Goodrich

New 1049-G Turbo Compressions—the latest addition to Northwest Orient Airlines fleet—offer the assurance of dependability.

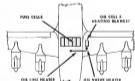


B. F. Goodrich brakes stop this plane smoothly, give long service with low maintenance, never over wear. When final position is maintained, a full cycle "rub" lifts each brake block evenly around the full circle of the drum. The entire braking surface is skidless. **B. F. Goodrich wheels** are made of magnesium alloy for great strength with light weight. The new **B. F. Goodrich luggage panels** are as-light as you easily expect among yet flexible. Made of a glass fabric combined with a special rubber compound, they're opened by **B. F. Goodrich Pressure Sealing Zippers**.



The wings of Northwest's 1049-G's have the most efficient for protection yet developed—new **B. F. Goodrich shatter-proof De-Icers**. The small rubber tubes that inflate to snap

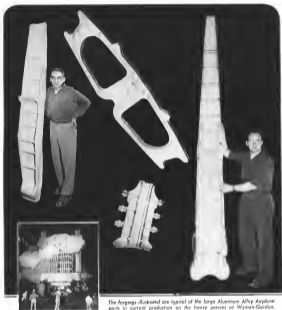
off ice are built chordwise, in line with the stream. They maintain a smooth flow of air over the wings even during the 3-second inflation cycle. Like **B. F. Goodrich Type 21 De-Icers** on the tail, they remove ice effectively with a high pressure snap.



B. F. Goodrich fuel cells add to flight range, yet take up minimum space. **B. F. Goodrich oil cells** contain electrically heated rubber "blankets" that keep oil at proper temperature. Heated rubber "jackets" around oil valves assure positive action at all times. And **BFO oil line heaters** keep oil flowing freely.

These are typical examples of the many **B. F. Goodrich** aviation developments that help keep modern airlines on the go from take-off to landing. The **B. F. Goodrich Co., Akron, Ohio**.





The forgings illustrated are typical of the large Aluminum Alloy Airplane parts in current production at the heavy presses of Wyman-Gordon.

WYMAN-GORDON CO.

Established 1883

FORGINGS OF ALUMINUM • MAGNESIUM
STEEL • TITANIUM

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A new era in the art of forging has been demonstrated as production goes forward on this 35,000-ton closed die forging press. Larger forgings with thinner sections and closer tolerances than heretofore possible open new concepts in forging design. Wyman-Gordon continues to pioneer by — Keeping Ahead of Progress.

NEWS DIGEST



MID-SPAN CONTROL SURFACES, a redesigned landing and liftoff wings make the difference between this North American P-4 Corsair and its ME predecessor. Location of movable controls is aimed at increasing their effectiveness by eliminating several due to airframe twist. Flap tips are ahead of ailerons, which can be dropped to provide extra landing lift. Cockpit braced has been changed to lie slight drop on the leading edge. Powerplant is a Wright J-65 W-5, rated at 7,400 hp. Rate thrust. Armament is Navy standard of four 20-mm. cannons, plus external stores. New paint scheme, gray top, white bottom, a new Navy standard. Top speed of the cross-landed P-4 Corsair is over 399 mph.

Domestic

Boeing 707 jet makes transport prototype for KC-119 is being fitted with Boeing-developed flying boom and refueling system. Plane is expected to be flown with the refueling boom in August, according to company spokesman.

Crushed missile reliability in subject of USMC classified experiment to which industry is invited. Symposium will be held at Wright Air Development Center No. 2-4, Dayton and Dayton groups may also attend. Wright Mr. R. L. Dingle, Director of Weapons Systems Operations (WCSOP), WADC, Ohio.

First production Convair F-102A delivery to USAF. All weather fighter has been delivered to the USAF at Edwards AFB, Calif. Production airplane features a new point scheme, gray base, light mid wings, black nose, and dull paint atop the nose and engine intakes. Except for the nose, earlier models were suggested.

Contract exceeding \$5 million for an improved version of General Electric's remote controlled radar-directed B-47 armament system has been awarded by USAF to GE's Aircraft Products Department. New equipment is more efficient and easier to maintain, GE says.

Eng. Gen. Clinton D. Vincent,

Deputy Chief of Staff for Operations, Connecticut Air Command, was fired dead in his quarters at Colorado Springs, Colo. July 5. He was 40. Vice president of the company was 39. During World War II he shot down 16 Japanese aircraft and was awarded the Distinguished Service Cross of the 14th AF in the China-Burma-India Theater under Maj. Gen. Claire Chennault.

Andre Havel, 61, consulting engineer for Stinson-Dumont Fairchild Engine & Airplane Corp., 100 Shore N. Y., died June 10. Havel founded Stinson after being expelled out of France during World War II. The firm was later absorbed by Fairchild.

Advanced Research Domain aircraft exhibited in 1948. Helicopters, F-4s, A-1s, C-1s, will provide facilities for advanced and basic research into unpowered, convertible and vertical takeoff aircraft. New building for the division will be completed this fall.

Financial

Thompson Products, Inc., Cleveland, Ohio, has acquired Koll Douglas Associates Inc., Lincoln, Calif., maker of hydraulic and pneumatic cylinders and valves and will assist the firm's expansion in semi-mechanical systems for aircraft and missiles.

Vitre Corporation of America, New York, has purchased a substantial in-

terest in Thibault Aircraft Co., Inc., Bethesda, Md., an engineering firm working on design, development and production of aircraft components and various systems. Thibault plans additional facilities in Martinsburg, W. Va., to assist Vitre research in electronics, electro-mechanical and weapon systems.

International

Vickers Supermarine S2B, prototype for a forthcoming Royal Navy fighter, crashed during recent flight. The pilot, Lt. Cecil "Bobby" Radlett, ejected at low altitude, but his chute did not have time to open and he was killed.

New women's speed record of approximately 713 mph was set June 30 near Paris by Miss Jacqueline Auriol flying a Dornier Do 16 jet fighter at 70,000 ft and at 5,000 ft. The mark exceeds the former record of 674 mph set by Miss Jacqueline Cochran in an F-5C Sabre at Edwards AFB, Calif., June 3, 1951.

Total operating incomes of Canadian airlines in January were \$7,591,646, compared to \$6,991,732 in January 1954, according to figures recently received by the Dominion Bureau of Statistics. Total operating expenses for the first month of 1955 were \$8,195,418, compared to \$7,531,418 in January 1954. Revenue passenger miles totaled 152,615 last January, compared with 131,336 in January 1954.



When the mercury dipped to 46 below at Lehti Field, Alaska, the U. S. Air Force soaked SPAR with water despite the "big freeze", the action of this lightweight, portable GCA radar completed immediately.

SPAR'S assets can't be frozen!

More accurate than any comparable GCA tracking system, SPAR has come through every rigorous test with flying colors. Neither freezing temperatures, torrid heat, blizzards nor monsoons have hampered its effectiveness. SPAR's accuracy, dependability and durability have been engineered into a unit so light, so easy to use that within thirty minutes of its arrival on the scene, SPAR can "bring you in on

the action" in the simplest weather imaginable. And amazing as it may seem, SPAR costs only 35th as much as any other GCA system in production. No wonder the Air Force, the Navy, European governments, and airport managements are vitally interested in SPAR—the most revolutionary advance in GCA radar.

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Washington Roundup

Pressure on Fred Lee

Dismissal of Clark J. Loren from Civil Aeronautics Administration (CAA) is thought to signify administration is another indication of increased Commerce Department control over CAA and its subordinate Civil A. Lic. The deputy administrator's post has been vacant since Loren moved up to the top CAA post in 1971. Lee made no secret of the fact that he did not want a deputy. Loren's appointment is sponsored by Louis Rothschild. Under secretary of Commerce for Transportation who like his predecessor, Robert Myers, is disturbed about CAA's program and administration.

Talbott on Dispersal

USAF Secretary Harold E. Talbott has declared responsibility for use, avoidance of prime construction in not all small business administration in Southern California.

If they do Talbott says in effect, it is not caused by any dispersal instructions from his office. In a letter to California's Republican Senator Thomas H. Rosten, the Secretary also said he has no evidence "but production schedules are being extended because of lack of classification of Air Force dispersal policy."

Quick Action on Airport Aid

House Commerce Committee is acting with speed on legislation providing \$45 million in federal support and annually for the next four years. The Aviation Subcommittees held two days of hearings. The outlook is that the committee will report out the measure this week and the House will pass it before adjournment. It has already passed the Senate, unanimously (AW July 4, p. 15).

The House Committee may add language to procure a subsidy to the remaining airports based on the records of commercial airports from various types of military operations.

Short Life Nike

Congress is going along with Army's request for an additional \$100 million for Nike air defense installations in fiscal 1976—end with some reductions.

Senate Armed Services Committee noted that it was approving the request "nonetheless a reduction that the system may be introduced within the next few years by new anti-aircraft systems having greater range than are now under development." The committee explained.

"The fact that something better is hoped for in the future would hardly justify a refusal to provide the best system that is available today. In these circumstances, however, it is important that the Nike system be immediately evaluated in relation to new developments in this field."

"We trust that this evaluation will be carried on by both the Appropriations Committee and the Department of Defense."

R & D Headquarters: Where?

The Senate voted 56 million authorizations for new headquarters for Air Force's Research and Development Command and funded its relocation—but declined to go

along with USAF's plan to locate it at Wright Patterson. Senate Armed Services Committee declined authorization of the location, "with particular weight being given to the dispersal problem and to earlier accommodations on this subject." It was pointed out that a 1953 USAF study, headed by Lt. Gen. David Cook, then Deputy Chief of Staff, Material, recommended location at Andrews AFB, near Baltimore. "A similar case has not been made for Wright-Patterson as the most advantageous location," the Senate committee declared.

Investigation Notes

• Coast on Senate Banking and Commerce Committee, headed by Sen. William Fulbright (D., Ark.), to turn over the task of investigating the 100 largest defense contractors in the Senate Preparedness Investigating Subcommittee. Defense Department complied a listing of the "largest" in the banking committee's request. Many members of Congress think it put forth a "false front" covering the period from mid-1945 (instead of mid-1950, the start of the military buildup) through 1974. It showed General Motors Corp. as having a "percent" volume of defense business (AW May 30, p. 15).

• Sen. Landon Johnson (D., Tex.) almost raised the question of a new chairman or acting chairman for the Preparedness Subcommittee. The agreement is up to Sen. Richard Russell, chairman of the full Armed Services Committee. The top Democrat on the investigating subcommittee, and the logical selection for chairmanship, is Sen. Ernie Fuhrman (D., Tenn.). Other Democrats on the subcommittee are Sen. John Stennis (D., Miss.) and Sen. Stuart Symington (D., Mo.). If a substitute for Johnson to the Senate Democratic place is named, it would probably be either Sen. Henry Jackson (D., Wash.) or Sen. Sam Ervin (D., N. C.), in that order.

• House Armed Services Investigating Subcommittee, meanwhile, is conducting its investigation of the specific charges of various manufacturers on a "black book" basis. Charges have gone out that only three persons say discuss the investigation: Rep. Carl Albert (D., Cal.), chairman of the full Armed Services Committee, Rep. Edward R. Roybal (D., La.), chairman of the subcommittee, and John Courtney, counsel. They have and little to say.

Balboa Bottle

Civil Aeronautics Board will expedite action on the Balboa interchange now to get it out of the way as soon as possible. The case has been hot in recent weeks at the long-standing feud between Pan American World Airways and W. R. Grace & Co. broke out a bottle even who should use the interchange with National Airlines. Each has filed a separate agreement with National, and the Board will have to decide who will contract with NAL at Miami. While PAA and Grace are exchanging heated remarks, Aviation Air Lines and Gulfstream have quietly filed an agreement of their own. CAB is determined that the Balboa case, which has dragged on for years, will be completed as quickly as it can be processed.

North American Still Fighting

North American Aviation is reported trying to get relief through the White House from the Civil Aeronautics Board decision to get the carrier out of business (see page 197).

—Washington staff

Technicality Costs Dr. Zwicky Military Security Clearance

Los Angeles—Dr. Fritz Zwicky, an aircraft consultant to the Aerojet General Corp., Azusa, Calif., has been denied security clearance by the Defense Department under a technology of the Atomic Energy Industrial Security Regulations.

The regulations state that an alien who does not take positive action to become a U.S. citizen cannot hold security clearance.

Because Dr. Zwicky is a Swiss national and refused to apply for American citizenship the Navy withdrew the clearance as an administrative decision based on his alien status.

"This is a giant of the sciences as I won't question the decision," Dr. Zwicky said. He added, however, that he "was better at fighting Communism as a Swiss than as a national citizen because I am more interested in all parts of the world."

Aerojet General does not plan to protest the action against its company President Don A. Korb and Vice President W. W. W. W.

"We will put him on an unclassified work," Korb said. "The action does not decrease his value to us." Korb said that there has been no question of removing Zwicky from the company's scientific advisory board. The Aerojet president said the scientist's own value to the firm is not in his work with classified details but in his contributions in the field of ideas.

He and Zwicky has been doing research in the field of space satellite vehicles and in the future may also develop some in important aeronautical studies.

The Bulgarian-born scientist has made some contributions to rocket and guided missile developments as this country.

In 1948, President Harry Truman ordered an investigation of the extent of high level secret information disclosed outside the U.S. to a civilian, the Model of Exclusion. This was for his investigations in Germany during 1945 into the development and manufacturing of such German aircraft as the V-2.

Zwicky also is credited with progressing in 1943, prior to the defeat of Germany, that some of U.S. scientists and engineers be trained for a mission of investigation in Germany after the war to take full advantage of technical advances in weapons made by Germany.

The scientist has been on the staff of the California Institute of Technology since 1937, becoming a full professor in 1947. He is the author of many publications on astrophysics.

Zwicky, together with Theodore Van Klee, was one of the founders of the Aerojet company. He served as a research director there from 1943 to 1949 when he became chief research consultant and a member of the company's technical advisory board.

During World War II, the scientist served as technical advisor for the Office of Civilian Defense. He is a Fellow of the American Physical Society and a member of the Astronomical Society of the Pacific.

Aerojet Could Build Space Satellite Now

Los Angeles—Aerojet-General Corp. could start immediate construction of a successful space satellite vehicle, says President Don A. Korb and Vice President W. W. W. W.

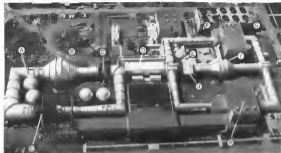
"We can give them a definite date and a fixed price on the contract," he said. Work on the space satellite would be done in stages, according to the Aerojet executives.

First step would be research in "choosing pieces of metal off the earth." This would be followed by design of a 10-ft. vehicle, which would orbit at a distance of between 200 and 400 mi. above the earth while carrying radio contact.

This vehicle could be followed by a 100-lb. object, then a 3,000-lb. device, and finally "something you can get people on," Korb said.

Oberth at Redstone

Dr. Hermann Oberth, a pioneer in rocket science, will be invited to give the U. S. Army Ordnance Guided Missile Development Center, Redstone Arsenal, Huntsville, Ala. Oberth's major contribution to rocket engineering was his publication in 1927 of a detailed mathematical treatment of interplanetary travel.



UNITARY PLAN WIND TUNNEL, now complete at NACA's Ames Aerodynamic Laboratory, Moffett Field, Calif. It will provide three test sections covering speed ranges from Mach 0.7 to 3.5. The photo shows: A) drive air through plenum; B) drive air; C) drive air; D) drive air; E) drive air; F) drive air; G) drive air; H) drive air.

Ames Unitary Tunnel Nearly Complete

By Irving Stone

Moffett Field, Calif.—A unitary plan wind tunnel, uniquely combining a transonic with two supersonic facilities and spanning a speed range from Mach 0.7 to Mach 3.5, will commence operation late this year at the Ames Aerodynamic Laboratory of the National Advisory Committee for Aeronautics.

One of three NACA unitary plan wind tunnels designed to provide continuous study for industry on planes, missiles and engines in development, either then to augment NACA's basic research, the Ames tunnel will serve as a test bed for:

- Flow data on future specific designs in model stages of development;
- Study problems arising in connection with aircraft or missiles which are generally in development or operational stages.

Already, Ames administrators have had preliminary discussions with representatives of several aircraft companies for tests projected for both aircraft and missiles.

Initial Tests

Some of these aircraft and missiles are in various stages of development. Initially, tests probably will include stability and control in subsonic and low supersonic flow.

Configurations to be developed include an aircraft or missile in the subsonic regime, although a certain block of time will be set aside for studies of commercial planes.

The Ames wind tunnel will serve as a test bed for a variety of wind tunnel tests, in general larger than can be handled in most supersonic

tunnels operating today. Models of planes or missiles will be supplied by industry, but some tunnel tests will be conducted by personnel of the Ames Laboratory.

Ames Laboratory will cooperate closely with the aircraft or missile builder in connection with particular development tests. After a test has been approved and scheduled, the builder's representatives will move into a private shop facility in the laboratory where initial model preparation and special servicing stations can be made prior to the execution of a particular tunnel section by a previous user.

Since there are three tunnel sections at the Ames unitary plan wind tunnel, it is conceivable that there could be three users while representa-

tives of three other companies could be preparing in the allotted shop facilities, for testing to be initiated as soon as each section is free.

Computer Arrangements

The private shop facilities offered by Ames would meet several security classification or proprietary interests, too. One highlight of the Ames facility is its computer system—a mechanism of electronically available electronic components put together in Ames technique for application in the three sections of the facility.

The computing machine interprets complex test results quickly, plots them on charts while the run is in progress, permitting current evaluation of the test program. This allows corrections to be detected in the test, and even some considerable necessary testing.

Here's how the computer works: it converts analog output signals from the model instrumentation to digital form, performs calculations to make accurate corrections to these data in accordance with predetermined conditions, and converts them to the form required for final presentation, such as semi-logarithmic coefficients of lift, drag and pitching moments.

A single point of this final data is



NACA Tests Wing Extensions on F-86

Increased lift characteristics can be given essential wing modifications by lengthening the wing chord, NACA scientists have determined after extensive wind tunnel and flight test programs. Here Ames Aerodynamic Laboratory researchers prepare to test modified leading edge extension on standard F-86A using at Moffett Field, Calif. The outside device is photograph is fabricated of wood for research.

Unitary Wind Tunnels

The three new wind tunnels designed for development studies from Mach 0.7 to five times the speed of sound on going into operation this year at NACA's Ames Langley and Lewis laboratories.

Three other tunnel facilities, along with those at USAF's Ames Engineering Development Center at Tidwelltown, Tenn., are being constructed under the authority of the Unitary Wind Tunnel Test Act of 1949, designed to meet the growing need for development research in supersonic flight.

Swinging equipment during World War II caused NACA to emphasize development tunnels, and the balance between this effort and the department's fundamental research has not shifted.

Also, it was obvious that, because of aircraft and engine performance progress, development testing would have to be accelerated. As a result of this effort, the industry wind tunnel was prepared to receive the proper balance of effort between development research and basic research.

The new NACA tunnels will take over the development test load from other tunnel facilities, so that the latter can be devoted essentially full time to NACA's research problems of a fundamental nature.

expected to be obtained about six months after the initial output signal is taken.

March Ranges

The Ames center plus wind tunnel will have:

- An (H-1) H-1 transonic test section with a Mach range of 0.7 to 1.5
- An (H-2) H-2 supersonic test section with a Mach range of 1.5 to 2.5
- An (H-3) H-3 supersonic section for handling Mach values from 2.4 to 3.5

Calibration tests are just beginning in the H-2 H-2 circuit.

NACA's Langley Laboratory counterpart of this tunnel, also devoted to development studies of planes and missiles, will operate over a Mach range of 2.2 to 5, using two separate nozzles and two test sections. First installation is presently scheduled for this summer.

NACA's Lewis Laboratory counterpart, now in final construction phases, will handle development studies of propeller units. Mach range will be 2 to 3.5 in a single 1000 ft. test section.

Studies also will be made of air vehicle, solid rocket, internal ducting, and other critical components associated with propulsive systems.

Studies on the air intake duct should pay big dividends. Already, matching of supersonic pressure plane ducts to jet engines has proved to be a critical problem indicating that considerable development effort will be required (AW July 4, p. 15).

Programming and Scheduling

Test programs and schedules of all these unitary plus wind tunnels will be coordinated through two divisions and twenty groups already established for aircraft and missile projects.

members for propeller projects. These groups are made up of test members and

test alternate staff from Air Force, Navy, Army, and NACA.

The three-one-one tunnel arrangement at Ames was evolved because it was found this installation, test section and facilities throughout the Ames Mach number range, could best be provided by three separate nozzles.

Constructors of these separate nozzles saw considerable constructional feasibility in this, if they could be operated from a single source of power, located the drive section in the most expensive part of a large tunnel. Drive consists of four independent motor-driven motors with a combined test output of 182,000 hp, with a boost up to 216,000 hp for limited intervals.

Two Compressors

Because of the wide variation in flow requirements of the three nozzles, and the limited range of flow quantities over which a compressor can be designed to operate efficiently under all conditions, it was not feasible to design a single compressor to operate all three nozzles.

An H-1 stage, composed of one end of the motor drive section supplies either of the two supersonic wind tunnels.

Compressor output is directed to flow division valve through the current being used. Guide vanes rotate with the valve and serve to enter gas into the guide the air nozzles aimed the nozzle.

The total rotation of the valve, taking only about 5.5 sec., is done only when tunnel is stopped and operated at atmospheric pressure.

The compressor will handle about 90 tons of air per sec. increasing its pressure about 15 times. Leaving the compressor at about 450 ft. the air is cooled subsequently in 120 ft.

Driven from the opposite end of the drive motor assembly, is a three-stage

compressor to operate the transonic circuit.

This large action requires the compressor to circulate air at about 200 tons per sec., approximately five times the rate of flow of the H-1 stage compressor for the supersonic sections.

Thomas Reversal Now Allows Missile Displays

Navy Secretary Charles Thomas, in clearing his order banning all public display of guided missiles, will now allow them to be shown publicly, subject to review by the Navy.

The new Navy order and public display of new guided missiles and experimental aircraft will have to be specifically approved by Navy headquarters in the Pentagon. Henceforth, the Navy will approve such as the Vought Republic, Spirit, Sparrow, and Cougar Torpedo.

It is to be published, displayed with special printing to designate their component parts.

Oblique missiles such as the Luna, Gagan and Lark and research vehicles such as the Martin Viking can be displayed without restriction.

No missiles such as the Talos anti-aircraft missile, the Povey anti-submarine device, and the Skywarder air-to-air missile cannot be shown publicly yet.

Thomas, sudden order banning all Navy missile displays occurred May 11, after Armed Forces Day and Armed Forces Day of children including the Space Station that had already been approved by Navy, USAF and Army.

It was followed by the Navy's ban on public display of missiles, and were well represented in the Armed Forces Day shows with various missiles.

Neumeier Selected As ACC Secretary

William Neumeier, a former Navy official, has been selected by the Joint Congressional Committee on Atomic Energy and a member of the Armed Services Committee.

Neumeier will succeed F. Lee Moore, who, a short while ago, who retired his resignation to be effective May 15. Moore plans to return to the civilian world.

Neumeier served as an anti-submarine patrol bomber pilot in World War II and was recalled to active duty for the Korean war. He has been in business in Los Angeles since leaving the Navy after Korea.

\$7.2 Billion for Planes in 1956 Budget

The \$11.5 billion defense budget for fiscal 1956 includes \$7.2 billion for the procurement of 4,000 new aircraft by Air Force and Navy's substantial increase over the \$4.7 billion for fiscal 1955.

USAF's share of the over \$6.1 billion—more than double the \$2.7 billion in fiscal 1955 aircraft and related procurement—provides for 2,400 new planes.

The \$908 million for fiscal aircraft procurement, the amount added to Navy's, is less than half the \$1.5 billion for fiscal 1955. It will finance 3,400 new planes. The reason for the cut back Navy will start off the fiscal year with a big run-out of unsold inventory as estimated 5500 engines, some of long-range capabilities of combined planes and engines. Start up with fiscal 1957 fiscal aircraft procurement funds will increase sharply.

Procurement of 2,400 new planes, an increase of 1,000 from fiscal 1955, will be required to keep a 16-air plane group fleet modern, Navy estimates.

This was the estimate in the Defense Appropriation Bill sent to Congress by the President, of present needs, possible commitment with present technological developments and efficient application of appropriated funds.

That demand was stated in the joint report of the House and Senate on the Defense Budget. USAF's failure to

provide for the appropriate number of the Congress, including need of aircraft use as a number.

"The Defense Department is well aware of the problem and is aware that appropriate and effective action have been taken from time to time as the world situation changed or as additional information became available."

Commenting that "in the best of our knowledge we have never expressed our own views on these questions before an examination of the Congress of which I am a member," Jackson replied by repeating Wilson to Kennedy's answer on a disapproval basis to be the military application of technology to be the end of our work." Jackson commented that the question he submitted about military which "are for the most part already in the public domain."

Before submitting the question to Wilson, Jackson in a public speech declared that he was "troubled by the nature and growing evidence of the

Fiscal 1956 Defense Money

This is how defense appropriations for fiscal 1956 compare with fiscal 1955:

| | FY 1955 | FY 1956 |
|-------------------------|------------------|------------------|
| Secretary of Defense | \$12,780,000 | \$12,870,000 |
| Subcommittee Activities | \$12,780,000 | \$12,870,000 |
| Army | \$2,419,000,000 | \$2,329,000,000 |
| Navy | \$2,419,000,000 | \$2,419,000,000 |
| Air Force | \$2,419,000,000 | \$2,419,000,000 |
| Total | \$28,000,000,000 | \$28,000,000,000 |

Missouri, Congress awarded an Air Force request for more money to speed up production of two new supersonic fighters—the long range McDonnell F-101 and the Lockheed F-102 day-fighter. Secretary of Air Force Harold E. Johnson, on the advice of USAF's Chief of Staff, Gen. Nathan F. Twining, has informed Congress that production of these two types should be accelerated (AW June 25, p. 12).

Defense Secretary Charles E. Wilson was expected to approve Talley's decision.

The Air Force was directed that plans procurement be accelerated in the extent possible consistent with present technological developments and efficient application of appropriated funds.

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elaborate procurement funds by letting contracts has caused widespread congressional criticism.

The Secretary of Defense has given efforts to transfer up to \$50 million from other military categories for emergency projects. Defense Department asked for transfer authority for \$500 million to finance research and development projects that they are unimportant "break throughs" during the war. The \$11.5 billion specifically requested for the "emergency" fund was approved.

The \$570 million provided for USAF's fiscal 1956 aircraft and development programs is \$172 million more than the fiscal 1955 allocation.

The \$165 million authorized for naval system research, though a \$7 million less.

ordinarily used program the Soviet Union is making in the field of air power" and argued that these steps be taken.

"I propose that our production of jet fighters and fighters be placed on a crash basis at once—in a fast-track footing."

"Second, I propose that there be an expansion of jet-powered aircraft order, that capacity. Existing aircraft plants should now operate around the clock, seven days a week."

"Third, I propose that we immediately create a board of jet industrial experts to determine what we are now doing that the Soviets are leading up for the most production of aircraft. We cannot prevent war with models stretched on drawing boards."

"Fourth, I propose that we immediately begin a program of jet industrial experts to determine what we are now doing that the Soviets are leading up for the most production of aircraft. We cannot prevent war with models stretched on drawing boards."

"Fifth, I propose that we immediately begin a program of jet industrial experts to determine what we are now doing that the Soviets are leading up for the most production of aircraft. We cannot prevent war with models stretched on drawing boards."

"Sixth, I propose that we immediately begin a program of jet industrial experts to determine what we are now doing that the Soviets are leading up for the most production of aircraft. We cannot prevent war with models stretched on drawing boards."

"Seventh, I propose that we immediately begin a program of jet industrial experts to determine what we are now doing that the Soviets are leading up for the most production of aircraft. We cannot prevent war with models stretched on drawing boards."

"Eighth, I propose that we immediately begin a program of jet industrial experts to determine what we are now doing that the Soviets are leading up for the most production of aircraft. We cannot prevent war with models stretched on drawing boards."

"Ninth, I propose that we immediately begin a program of jet industrial experts to determine what we are now doing that the Soviets are leading up for the most production of aircraft. We cannot prevent war with models stretched on drawing boards."

"Tenth, I propose that we immediately begin a program of jet industrial experts to determine what we are now doing that the Soviets are leading up for the most production of aircraft. We cannot prevent war with models stretched on drawing boards."

REYMA Grows

Growing interest of aircraft manufacturers in aircraft safety is reflected in membership list of Radioelectronic Television Maintenance Association, trade organization with national headquarters in Washington.

Current Division of General Dynamics, Inc., and Boeing Airplane Co. have been members for about six months. Last week REYMA announced North American Aviation, Inc., has been elected to membership.

REYMA is composed of 199 manufacturers of electronic equipment.

Soviets have been able to build up for many purposes of aircraft more quickly than we have in other words, that their lead time from the design of prototype aircraft to mass production models is shorter than ours.

Now, is it accurate to say that, by 1960, the Soviets will probably have more aircraft and engines working in the airport field than we ourselves will have?

Yes, it is accurate to say that, if present trends continue, the Soviets may be ahead of us in airport-built aircraft in quantity and quality by 1960.

However, is it accurate to say that the Soviets may achieve a continental ballistic missile with a 4,000 to 7,000 mile range—before we will? If so, what degree of likelihood do you attach to this possibility?

Twice, it is accurate to say that the Soviets may achieve an environmental ballistic missile before we do. If so, what degree of likelihood do you attach to this possibility?

New Board Set Up For Engine Planning

Recent unexpected shifts in engine requirements that resulted in Air Force contract cancellations have brought about a new agency to coordinate upcoming USAF demand for power units. Its name: Air Force Aircraft Engine Logistics Planning Board.

The purpose, stated in Air Force Regulation 460.11, is to "provide guidance in the development of logistics plans which govern the determination of our requirements for spare engines."

Major factors in USAF's decision of last year that it had no estimated jet engine requirements was increased engine life and fuller utilization of air life to cut down the number of units held up in the pipeline.

These and other factors will be considered by the new Planning Board. To establish requirements, the group will use such data as:

- Aircraft operational concept.
- Aircraft development.
- Pipeline factors.
- Engine life expectancy.
- Repair capabilities.
- Aircraft production rates.
- Methods of distribution.
- Attrition.
- Utilization in peace and war.

The new regulation says that special emphasis will be given to spare engine logistics, with a continuing study of interest factors, such as: building of replaceable engines and overhaul bases.

Individual policies will be set up to meet the needs of special operations. Future meetings of the new board will be held twice a year. In addition, representatives of the Air Materiel Com-

mand and other agencies will be called when necessary.

Members of the board will come from:

- Programs & Requirements Division, Directorate of Supply & Services, AFMC.
- Comptroller & Packaging Division, Directorate of Supply & Services, AFMC.
- Directorate of Procurement & Production, AFMC.
- Directorate of Maintenance Engineering, AFMC.
- Directorate of Supply & Services and Maintenance Engineering, Engine Prime Air Materiel Area.
- Headquarters, USAF.
- Other major commands.

Dept. of Commerce Tightens Surplus Rule

Aircraft and aircraft components are included in a list of more than 55 "sensitive items" recently made subject to tightened control by the Department of Commerce when they are offered for clearance sale as surplus by U. S. Air Force.

New rules calling for special market impact studies have been imposed on top of existing regulations that require clearance from Commerce for sale of surplus property having an acquisition cost of \$250,000 or more (AWF May 16, p. 28 and June 20, p. 33).

Depending on condition of the goods, "sensitive items" with a acquisition cost down to \$1,000 now must be brought to the attention of Commerce's Surplus Property Report Coordinating Office when they are put on the market.

The new USAF Regulation No. 68.4, says Commerce has agreed to make studies of surplus personal property scheduled for sale by military agencies and evaluate the cumulative market impact of such offerings upon economy in categories, present and employment situations.

- Among the sensitive items listed are:
- Aircraft, fixed wing, complete.
 - Aircraft, rotary wing, complete.
 - Airframe structural component assemblies.
 - Aircraft propulsion and their components.
 - Aircraft landing gear and components.
 - Aircraft wheel, brake systems and components.
 - Aircraft hydraulic, vacuum systems and components.
 - Nylon parachutes.
 - Aircraft accessories and their components.
 - Gasoline reciprocating aircraft engines, component assemblies and spare parts (including hardware).
 - Operational training devices.



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Lagging Public Construction — A Spreading National Blight

The most recent editorial in this series dealt with the plans of American industry for expanding and modernizing its plant and equipment over the next four years. The plans call for the expenditure of \$18 billion over that period. There is a good prospect that the money to carry them out will be available. If the plans are carried out, manufacturing capacity at the end of 1955 will be double that which existed at the end of World War II. And this industrial plant will be modernized.

In sharp contrast to this picture is the condition of our public plant and equipment—the roads, schools, water supply, health and sanitation facilities upon which industry, as well as the average family, depends. According to a recent estimate by the Twentieth Century Fund, the people of the United States must spend almost \$100 billion on new public works projects during the next five years merely to meet the minimum needs of our growing economy.

Other estimates by the President's Council of Economic Advisors, by state agencies and by private construction economists all show the same condition: a staggering need for public works. Yet no steps have been taken that even offer a promise of closing the gap between the public facilities we are building and the greater facilities we really need.

How did we come to let our public facilities fall into this sorry state? Here are some of the reasons:

(1) During the years of depression and war, from 1930 to 1945, these facilities were neglected. New construction declined, and even maintenance was cut.

(2) Since the end of World War II, increased construction costs have made it difficult for communities to get the needed construction with the funds budgeted in the past for that purpose.

(3) The great postwar spurge in population, and the spreading of our population into new areas, has created a huge demand for additional community facilities before the neglect of earlier years could be made up.

Responsibility Divided

Now the need for more public construction has become apparent to everyone, on packed highways and in over-crowded schools. But, unfortunately, the responsibility for doing something about this situation cannot be so clearly fixed as can the responsibility for maintaining industrial facilities. A business firm must expand its capacity when markets are growing or lose its trade position. It must modernize its plant and equipment or be outdone by more efficient competitors. In the case of public facil-

ities, there is no such competitive incentive. To be sure, a city or state may lose population and industries if its public facilities are inadequate. But such shifts are very slow to take place and difficult to relate to any specific public program, or lack of it.

Moreover, the responsibility for constructing public facilities is divided between state and local governments and federal authorities. Within each of these governmental units there are specialized bureaus or departments with varying responsibilities. This division of responsibility obviously adds an element of difficulty to the development of an adequate program of public construction.

Breaking the Log-Jam

How can this administrative logjam be broken and the financial difficulties overcome?

One course would be to have the federal government step in with a nation-wide new program of direct spending on public works. That would utilize the resources of the federal treasury for immediate action. But there are weighty objections to such extensive federal participation. One is that federal spending cannot be greatly enlarged without a corresponding increase in the federal control of decisions that normally have been left to local communities. Another objection is based on the fact that so long as we want to maintain a large defense establishment, such an addition to federal spending means either higher taxes or a chronically unbalanced budget.

The other course is to rely primarily on local initiative, but with new and more effective federal aid to local governments. Such aid would help speed up planning and construction, and contribute toward a solution of the most head-on serious financing problems, but it presents sufficiently limited to require that most of the capital be raised locally.

No Single Formula

No one formula can be applied to make such aid effective. The raising of funds for new schools, for example, involves problems very

different from those of financing highways, or water-works, or hospitals. But it does seem clear that, in all three fields, the federal grants must be designed to stimulate more local planning and financing than has prevailed in the past. Among the new ideas that may offer such incentives are federal grants for planning and initial costs, and federal guarantees of local bond issues. Such aids have been remarkably effective in the fields of slum clearance and public housing.

While the federal government clearly has a role to play, we cannot afford to postpone inauguration of an adequate public construction program while we seek a formula to apportion governmental participation that would be generally accepted as ideal. Every year about 2½ million more Americans are getting increasing pressure on a public plant already dilapidated and inadequate. The result is an increasing menace to comfort, health, education and safety. It is also an increasing reticence to the effective performance of American industry.

The appropriate public response to this situation is a driving public determination to eliminate this increasingly dangerous lag in public construction. At this juncture, the development of such a determination is basic. Nothing stands in the way of an adequate program of public construction that a determined electorate cannot remove.

This message is one of a series prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important nationwide developments that are of particular concern to the business and professional community served by our industrial and technical publications.

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Donald C. McGraw
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First Flight over the English Channel

"The handiest as of nature is created in the Art" — The words are no longer barren! This was the exciting news on January 7, 1785 when Jean Pierre Blanchard, French scientist, and Dr. John Jeffries, American from Boston, made the daring and hazardous first air journey across the English Channel by balloon.

As the huge gas-filled sphere rose over the cliffs of Dover, passengers crowded the cone, as well as items off shore to watch this first air venture over the sea. All were well until Blanchard and Jeffries were in sight of the French coast. With one quarter of the gas lost, they began to fall fast.

As they sailed they threw over the sea everything from sand to food to apples and biscuits. "Not up" protesting the sea, they began to strip everything. Jeffries reported later: "Not until over Blanchard's counter were overhead did the balloon sag!" After two hours in the air Blanchard and Jeffries landed near Calais, where they received a most warm

that two centuries later a rocket can't do. And ESO research is part of this progress, helping to supply aircraft and engine builders, operators and pilots with the new and better aviation petroleum products they need.

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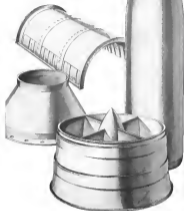


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South's consideration order in the entire case, and it will be held up until the court disposes of the Delta action for this.

Meanwhile, CAA wants to go ahead with the Louisville New York lawsuit investigation, so it has served lawsuit applications of American Airlines, Trans World Airlines, Eastern Air Lines and the Commonwealth of Kentucky and consolidated them into the Louisville-New York lawsuit as an "adverse investigation."

\$72.7 Million Budget Approved for NACA

Congress decided on a \$72.7 million fiscal 1956 appropriation for National Aeronautics Committee for Aeronautics—\$1.8 million less than NACA's request.

The amount approved, though, is \$16.5 million more than NACA's fiscal 1955 budget.

The Senate approved NACA's full request of \$76.5 million, after a plan from NACA's chairman, Dr. James H. Doolittle, that "by extending scientific research at this time, we are making early observation of the nation's air force."

The House had previously reduced the budget by \$8.6 million.

The \$72.7 million voted NACA includes \$80.1 million for operations and \$12.6 million for new construction projects (AW Week 13, p. 18).

The operational money will provide for same accident to research, although not as much as proposed by NACA, and operation of three new wind tunnels which will close into operation shortly. The construction money includes over \$4 million for a research research facility.

New Accident Report

A revised and redrafted aircraft accident report form CAA-954 has been approved by Civil Aeronautics Board. The new form will be used to report all accidents to civil aircraft with a maximum gross takeoff weight in excess of 12,500 lb. helicopters and all Alouette are covered equally regardless of weight. CAA has ordered use of the new report form beginning July 1.

CAA and redesign of CAA-456 was for purpose of providing additional and more detailed information to develop statistical and statistical data.

Correction

Vickers Supermarine Spit fighter did not "break up in the air" as reported in Aviation Week May 16, p. 51. The three crashes of the Spit resulted from causes other than structural failure in the air.

Engineering Design

Research Development

op-por-tu-ni-ty (op/por'tu'nati), n.,
advantage of convenience of attention;
appropriate or favorable time or occasion.

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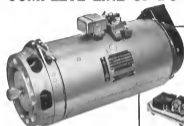
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FLOATING INTO FLOODED HOLD at a 40-ft Landing Ship Dock, Convair is guided by lines and poles. After LSO ramp is raised, hold will be pumped out and plane dry-docked.

Convair F2Y Tests its Sea Legs

Helicopters, hundreds of men and dozens of boats tied together by a complex order and radio communication network, monitor every test of Convair's twotail F2Y at Sea Dart, looking for any sign of trouble.

There is a specially-equipped boat fitted with stirring gear should the F2Y's Westinghouse J46 turboprops quit while it is in the water. A 420-ft LSO has been used as a "mother ship" to dry-dock the plane during its sea trials.

Recently a Navy team from Patuxent NAS, Md., made a research and development study of the lighter at Sea Dart. Their report is expected in the next few weeks (AW July 4, p. 7).

Two versions of the engine are under test; the one paired with dual hydro-skis and a water plane with a single hydro-ski.

Performance tests have already shown the F2Y is responsive in a short dry dock.



REGREEN on F2Y's wings await launching



FAST BRAT, with impetus stored, monitors Sea Dart trials



NAVY CRANE (background) stands by during Sea Dart test

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Modification of CAR Proposed for Turbines

Modification of Civil Air Regulations applying to turbine-powered airplanes has been proposed by the Bureau of Safety, Regulation of the Civil Aeronautics Board.

The draft proposal would amend section on engine rotation and instrumentation requirements in domestic, international and foreign C-ARs to modify their application to turbine engine installations.

Current CARs require airplanes to have means for stopping engine rotation in flight. The amendment would require means for stopping turbine engine rotation in flight only if the Civil Aeronautics Administration finds such rotation could jeopardize the safety of the airplane.

In view of the limited experience of air carriers with turbine engines, a so-called amendment would give the administrator authority to permit or require instruments for turbine-powered aircraft which would provide safety equivalent with present requirements.

PanAm Protests CAB Mail Pay Reductions

Pan American World Airways has protested the proposal of the Civil Aeronautics Board to make drastic cuts in mail pay for TAA trans-Pacific and Latin American operations (AW June 11, p. 112).

The international carrier says that mail pay proposed by CAB fails to provide a return on an investment of \$45-100,000 in Latin American operations and \$20,000-400 in Pacific operations, plus another \$15,000-400 in the Pacific shore equipment now on order to its fleet.

The Board based its reductions in mail pay on its policy of providing only for business need in setting rates. Pan American says that CAB has not followed that policy in setting rates in the past and has failed to recognize the need of a carrier for a return on investment in maintaining its financial standing.

In Pacific operations the Board put Pan American on a service rate, estimating that increased volumes of mail and would provide more than the business need. The carrier says that distribution of the mail traffic has shifted in favor of Northwest Airlines because of that carrier's superior route pattern. Pan American predicts that Northwest will get substantially all of the medium mail traffic when it is able to replace its DC-7s with modern equipment.

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of high efficiency proposed by On-walsh. This latter work has been one hour for more complete proposals.

Efficient Running

The goal of the engine designer is to get as high a pressure ratio as possible in the most efficient manner. In simple, the designer wants to get a stagnation pressure (total pressure at one with that air brought to rest) increased in many multiples of the free-stream pressure.

The theoretical ideal is when the compression is shock-free and reversible adiabatic (no heat added or lost). At Mach 2, the theoretical pressure ratio is about 10, comparable to the best turbojets at Mach 3, about 15, and at Mach 4, about 150 times free-stream pressure. These are ideal values; the problem is to approach them in practice.

There is another problem inherent in the basic concept of the engine. The turbine engine will not start if it is started in the combustion chamber is too high. The designer must first create a dead area to hold the flame in a velocity region where the airspeed speed is below the flame propagation speed of the mix. For information fact, this is only a few feet per second.

When he must make sure that the air passing by the dead area is traveling slow enough to allow the burning to spread beyond the dead area but not fast enough to blow it out of the area.

In practice, both high pressure ratio and low combustion-chamber speeds are achieved by efficient diffusion of the air. Consequently, the diffusion of the air is its most important single component. It follows that most

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| Hot | V | V |
| Die | V | V |
| Pressure | V | V |
| Investment | V | V |

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speed is going to be below Mach 3.7.

Next in completion is the non-vegetation inlet, sometimes called the inverted Laval nozzle. This inlet first contracts—which is a means of reducing the approach flow speed—and then expands. The transition point is somewhere area throat, where a shock wave forms and stabilizes. Flow upstream of the shock is supersonic down stream is subsonic. By reducing the approach Mach number, this type of inlet reduces the pressure loss across the shock.

There is one tricky aspect of this design. The shock must stay at the throat. If there is too much back pressure (perhaps a combustion surge in the combustor) the shock can be forced out, or repositioned from the throat. A reduction in back pressure can permit the shock to be swallowed again.

The sensitivity to back pressure is characteristic of most single diffusers and either restricts their operational speed range and increases the amount of leveled pressure required.

Mach numbers between 3.7 and 2.0 are the best operating range for the inverted Laval inlet.

Decreasing Losses

As the freestream Mach number increases, so do the losses. There is only one way to stop the inexorable trend toward decreased efficiency, and that is to change from a normal shock put down to a dual shock. A little goes a long way.

Velocity components across the diagonal shock can be broken into two components, one parallel and one normal to the shock. The normal component is obviously less than the freestream velocity, so the less this, the shock is less than if the normal velocity was the full value. The parallel component does not change, and, combined on the downstream side with the velocity normal component of velocity, results in a turned flow.

The practical value of all this is to produce a diffuser efficiency of about 51% at Mach 2.5 instead of the 33% obtained with a single normal shock inlet of the same type.

The design of an inlet to accomplish

this job is simple. A control pointed body is used to generate the diagonal shock; the flow is taken in through an annular cooling. The normal shock forms at the cooling lip to reduce the flow from the supersonic value behind the diagonal shock to the subsonic value associated with the pump across a normal shock.

The reasoning that produces the single-shock inlet—sometimes called the First type after Antonio Fiesi who developed the concept—can be extended to produce multiple shock inlets. If one diagonal shock is good, the remaining two are better and there is even better. Obtained in Germany during the first work on two- and three-shock inlets.

As the number of diagonal shocks increases, the efficiency curve gets closer to ideal value. In each case, though, there must be a final normal

shock to reduce the flow to subsonic speed.

There is a drawback to this technique. The inlet is turned and the flow enters from the centerline of the engine. This causes increased diameter and therefore drag in an engine after drag is to be minimized.

There is an aerodynamic trick that can be applied to eliminate the nose increase. The flow can be turned at the inlet and toward the engine centerline by reflecting the diagonal shock downstream in a properly shaped channel. The incoming air and gas through a number of diagonal shocks to subsonic speed, but the diameter of the engine stays within reasonable values.

The final step in the development of the multi-shock diffuser is to assume an infinite number of shocks to slow down and turn the flow. This leads to

a curved nose profile on the engine body, with a shock wave clinging to the surface, wrapping in the gas lip, reflected down the channel and finally going subsonic through a normal shock.

Recesses obtained by this kind of diffusion are several times those obtained with less sophisticated configurations at high Mach numbers. One well-designed inlet showed a design efficiency of three times normal shock efficiency at Mach 4.0.

Actual test results do not match theoretical numbers. One of the sources for this comes from boundary-layer effects. During the compression of the air outside the diffuser inlet and its subsequent passage through the boundary channel, the boundary layer builds up. There is a compressed interface between the shock wave and the boundary layer that tends to cause losses before the diffuser efficiency.

Another possible source of loss in actual applications comes from the sensitivity of these high-speed inlets to angle of attack. A slight amount of angle of attack is permissible—perhaps four or five degrees—before the value the pressure recovery falls off rapidly.

The use of high pressure and moderate velocity makes the target combustion chamber. Current techniques call for fuel to be injected at the end of the diffuser, followed by mixing of the air and fuel in the combustion chamber. Downstream of a fuelholder—usually, concrete rings of high drag—which controls the fuel flow rate, the fuel is held in the burner at that station in the combustion chamber.

Ignition is done at the center of the fuelholder.



Honeycomb Tow Target in Use

A production version of an aerial target, built for towing at jet aircraft speeds, has been developed by Honeycomb Structures Co., Inc., Los Angeles.

Known as Towbird, the target is a refinement of the towed target originally designed in plywood at Naval Ordnance Test Station, Inverness, Calif. (AON Dec 6, 1954, p. 37).

Reported as one of the breakers in flight by North American Aviation, Towbird is constructed of aluminum alloy skin enclosing porous honeycomb.

This makeup is said to lessen flutter characteristics of the target, hence permits it to be towed at faster speeds than the plywood counterpart.

The air intake forming the duct is constructed at the combustion area by means of a slotted circumferential structure.

The intake structure provides safe inlet velocity, while the duct walls have given adequate reflective loss and sh.

The towed target structure has porous outer skin, a 1,000 ft. nylon towline, the target follows well below the towing aircraft in flight.

Three sizes of the target are available—lengths of 12, 16 or 20 ft., with respective spans of 4, 6 and 8 ft. Length does not include pulse, which is adjustable to balance the target.

Survey Ties R & D Cut To Scientist Shortage

Industrial firms conducting a recent part of the national research and development are cutting back their plans for research-R&D programs because of a serious lack of trained scientists.

Although many scientists and engineers state that the shortage is as general as, and due to simplification of equipment, preliminary findings of a study of industrial research being made by the Bureau of Labor Statistics as part of the National Science Foundation's national survey of scientific R&D indicate that to engender the shortage is very real.

The survey shows that in just half of 200 large companies—81 out of 161 in chemical industries and all engaged in substantial research and development programs—report a shortage of trained manpower. To meet these two needs of the, the shortage is urgent.

To get a closer picture of the situa-

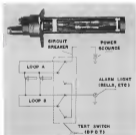
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4. **GET THE DATA** on Fenwal's passive Fire and Over-Head Detectors, Heat Controls, Alarm Gas Turbine Thermocouples and Auxiliary Controls. Fenwal specialists provide services for the entire aviation industry. Fenwal represents dual loop fire protection and control products. Write to Fenwal Engineering, Aviation Products Division, 117 Pioneer Street, Andover, Mass.

Fenwal Controls Temperature... Precisely

than as it is and as it is likely to be for the next decade, NBS is sponsoring a number of studies.

Manpower studies include:

- **Shortage of Scientific and Engineering Personnel in Industrial Research.** Title of the RLS series mentioned above. It is based on a sampling of 12,000 companies. Survey includes all firms in that group with 1,000 or more employees, plus a sampling of smaller firms.

- **Evaluating the Supply of Technical and Professional Manpower in 1965.** A study Columbia University is conducting for NSF. Related studies are being made by University of Minnesota (Loss of Talent Through Educational Drop-out) and National Research Council (Studies on Doctoral Degrees in Science).

- **A Technical Study of Methods for Determining Demand and Supply of Specialized Personnel** undertaken for NSF by the National Bureau of Economic Research.

- **National Register of Scientific and Technical Personnel** to be brought up to date in cooperation with the nation's professional societies and associations.

- **Scientific manpower in the federal government.** a monograph which will show distribution by agency and will include information on salaries, personnel engaged in scientific activities.

Studies on distribution of research funds include:

- **Research in industry.** Industry con-



Heavy Hugger

The new 6,000-lb hydraulic forging press has been designed and manufactured by Lyle Erie Engineering Corp., an adjunct to the USAR's heavy press program. Working area at 90 in. high to 18 in. by 36 in. front to back, maximum height is 150 in. Heavy Aluminum will use the press to forge heavy aluminum billets at Tuscon Cold Press building in Buffalo, N. Y.

AVIATION WEEK, July 11, 1955

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ducts approximately 65% of the \$4 billion research in the country. Federal and state funds finance 55% of the research, however.

•Federal funds for science. This is a reinforcing study—the latest report, Vol. IV, covering Fiscal Years 1974 through 1980, will be issued this summer. Federal R&D expenditures for Fiscal 1976 are estimated at \$3.2 billion, an increase of \$147 million over 1975. Basic research accounts for less than 7% of the total, NSF says. The Department of Defense accounts for about three quarters of total federal R&D.

•Research supported by the states. This is subject of a study conducted for NSF by the University of North Carolina. States covered in the survey are North Carolina, New York, California, Connecticut, Wisconsin and New Mexico.

•Research at nonprofit institutions. This covers expenditures in universities, financial support of graduate students, faculty and research manpower at universities, and research support by foundations. Russell says, "Foundation has loaned that of a total of \$142 million spent on research by foundations, only \$20 million went for scientific R&D."

•Research by trade associations has been reported to NSF by Battelle Memorial Institute. Trade groups spent \$11.5 million on applied R&D in 1975, and \$3.3 million on basic research. Professional groups spent about \$1.6 million in 1975, including close to \$2.5 million for basic research.

NSF estimates that research over the preceding 25-year period was responsible for between \$90 and \$40 billion of the nation's \$165 billion gross national product in 1975. Mellon stated cost of research for that period was about \$1.5 billion. This indicates a pay-off in the ratio of at least 25 to 1, says NSF, and raises the question as to whether we should not be investing more of the national income and effort in research and development.

Ground-Air Equipment Checks Camera Lenses

The Froehner, developed under contract with Georgia Air Force Depot, is an instrument for measuring aerial camera lens position in relation to film plane, checking lens focus, and for use as an autocollimator. It is designed to be used in flight as well as on the ground.

Unit employs a self-contained light projected through the camera lens and reflected back into the eyepiece.

The equipment functions as a portable optical bench and can be adapted to handle lenses welding with 7075-T6 aluminum. It is produced by Gordon Enterprises, N. Hollywood.



Northrop Douglas F-100 undertakes 134-degree turn at 17,000 feet, making a smooth and heavily loaded fighter turn at 18.

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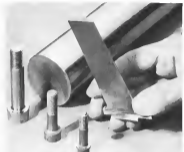
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- July 11-22—Special summer program in Aerodynamics of Steady Flow, Massachusetts Institute of Technology, Cambridge, Mass.
- July 12-14—Worcester Plant Maintenance and Degrading Show, sponsored by Clegg and Peltz, The Pacific Automobile, Los Angeles.
- July 16-14—Philadelphia Globe Council annual open house, Philadelphia Globe, Philadelphia, Pa.
- July 21-25—Katholisch-Helicopter Congress, Rotterdam, The Netherlands.
- Aug. 1-5—Experimental Aircraft Assn. third annual Pitt Is. and Governors, Gates Wright Airport, Milwaukee.
- Aug. 8—Institution of the Aeronautical Sciences annual National Turbine Power and Air Transportation Meeting, Chicago, Ill., South.
- Aug. 18-19—Air Turbine Assn. Convention and Technical Symposium, San Francisco.
- Aug. 18-19—Society of Automotive Engineers West Coast Golden Anniversary Meeting Hotel Marlborough Park, Los Angeles.
- Aug. 22-23—Symposium on Electronic in Automatic Fuel Injection, sponsored by SAE and Research Institute and the National Industrial Conference, Boston, Sheraton Hotel, San Francisco.
- Aug. 24-25—Western Electronic Show and Convention (WESTCON), Civic Auditorium and Fairmont Hotel, San Francisco.
- Aug. 24-25—International Systems Conference, sponsored by Scientific Division of Boeing Aviation Corp., Jersey N. Y.
- Sept. 1-10—Tenth annual National Aircraft Show, Philadelphia International Airport.
- Sept. 1-10—United States Flight Convention eighth annual Roundup Flight Show, New York to Newark.
- Sept. 12-14—International Society of Aircraft, 15th annual Conference and Exhibit, Stuart Exposition Hall and Auditorium, Los Angeles.
- Sept. 17-18—National of Radio Engineers Symposium on Automation Color Radio, Los Angeles.
- Sept. 28-29—American Institute of Electrical Engineers and Institute of Radio Engineers, 1957 Industrial Electronics Conference, Park Sheraton Hotel, Detroit.
- Oct. 3-5—Electronic annual National Flight Exhibit Conference, Westchester, Ohio.
- Oct. 14-16—Eleventh annual Aircraft Show and Exposition Conference, sponsored by Champion Sports Club Co., Santa Ana, Calif.
- Oct. 17—National Aircraft Assn. annual exhibit annual Meeting and Forum Sheraton Garden Hotel, Detroit, Mich.
- Oct. 30-1957 National Vacuum Conference sponsored by Vacuum Association of Oklahoma, Norman, Okla.
- Oct. 18-19—Golden Anniversary Aeronautical Meeting Aircraft Production Finance and Aircraft Engineering Display, Hotel Inter-Los Angeles, Calif.
- Oct. 19-20—International Air Transport Assn. 15th annual General Meeting Waldorf Astoria Hotel, New York, N. Y.

Air traffic control system made by CRAIG MACHINE, INC., gains high strength, all-weather protection with sandwich walls of **NOPCO LOCKFOAM**



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Some Uses of Nopco Lockfoam

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Re William A. Waterman and developed, former worked in her [Henson Sam showed a new small

Paris-Posteur French development is engine closely parallels the situation with regard to insects.

After the war, peasant French pasture practices, particularly in the lower forest,

were revised and German regions in production were excluded. ⁸ For

as the Hispanics and Americans, who also made Larrañaga were taken out for new foreign engines in power reborech, signed French machines. These were mostly of British origin (such as the innovative Bristol Hercules radial) engine which powers the Noronha Packet (see *Reconquista*).

namely of British origin (such as the otherwise Bristol Hercules radial engine which powers the Norton Packet line, Somerset).

Single pH buffers were also prepared for Foster's military aircraft. These were for the centrifugal-flow Rolls-Royce Neve and its development, as well as the Avon trial engine.

While these studies were underway

After the war, positive French positive

alternative Bristol Harbour route) giving a half-way to the Maiden Head

1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 26



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400-cycle alternator meets tough guided missile demands

Developed to withstand the tremendous range of shock, temperature and atmospheric conditions encountered in guided missile applications, the G-E explosion-resistant 400 cycle alternator meets rigid environmental and military specifications (MIL-E-52722A). Rated up to 1500 volt-amperes, 12,000 rpm, the output of 115 or 285 volts, the unit is designed to be driven by a wide variety of motor, turbine, and gas jet drives.

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To meet requirements of MIL-E-52722A regarding altitude, shock, temperature, vibration, humidity, fungus resistance, and centrifugal force, the alternator undergoes extensive testing—a standard procedure for all G-E aircraft and armament motors.

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Externally view of cartridge starter for jet engines shows main operating parts.



B-57 takes all start-up stress with General Electric cartridge turbo starters. Pilot is able to get immediate flight dependability parts at the peak of a startup. Starter torque output is relatively constant providing rapid start without damage to jet engine start valve.

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A small General Electric cartridge starter that will kick off the Air Force's Martin B-57 jet quickly takes its time in operation.

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without ground power, since no ground power units are needed for starting. Easy to use, the cartridge starting power. Further information on this starter can be obtained from your nearest G-E Apparatus Sales representative, or by checking "E" on coupon below and sending to the address GEA-5572A.

G-E transformer rectifier designed for reduced weight



At components of G-E show G-E transformer rectifier designed for easy inspection.

Converting ac power to dc on the General Electric Air Force B-36 are General Electric aluminum transformer rectifiers. The units are designed to offer a lightweight, highly dependable, flexible system of direct current, and require a minimum of maintenance. G-E now covers a range of applications for 300-volt to a constant power supplies ranging from 1 amp to 200 amps, both

regulated and unregulated. Regulation is accomplished by means of separate amplifiers. The output can be filtered to meet almost any ripple specification. Efficiency varies between 75% and 85% depending on conditions of operation and the type of load.

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08 to 260 hp. Peco, which also holds supplies within a series of capacities of air-cooled—four door to eight through an inverted cylinder, giving 138 to 475 hp.

• **De Havilland**, the British firm, showed a new, slightly larger version of its well-known six-cylinder inverted four-cylinder Geyser with a new induction system giving 280 hp.

Foreign Engines

Engine in the small-engine line came from Czechoslovakia, marketed by Motobay of Prague, it is the Praga Dora B. A beautifully made overhead camshaft flat six at 7.1-liter capacity, giving 280 hp, it weighs 590 lb. also. The engine is geared to 2,600 rpm, four-ball speed of 2,900 rpm. Fuel consumption is given as 0.51 lb. hp hr.

Compared with a U. S. Continental engine shows, the Dora B stands out in its external finish. The Czech engine is in production.

A Worcester conversion of the 250-cc Praxair flat four air-cooled engine was exhibited. For a weight of 145 lb it gives 35 hp. Together with Volkswagen 27 hp. engine, it proves many of France's built-in engine plans.

Vietnam targets and pulse jets are made by SNECMA. Rocket motors of the SNECMA type were seen in action, but we details were given.

Curtis-Wright exhibited information to the effect that its targets were used as experimental aircraft. A 600-hp turboprop version of the J65 was also exhibited by C.W. to be available in 1960. Its big freighter industry. No new American engines were displayed.

Britain showed publicly for the first time the Bristol Orpheon. The 580-hp, one which had passed the 150-hour test was the actual one shown. Be it, it may well have been in the field. Cost-remarkable is that it has only been running six months.

Compared with the small French ones, Orpheon is tuben and of considerably greater diameter, though short is considered to use the high prop speed of the Orpheon in its own class. Tested at 3,250 lb thrust, the Orpheon is expected to give 4,500 lb when developed. This is to be mounted to the order of 7,500 lb with other engines. Bristol also showed its Pegasus turbo-prop and Orpheon 100 (11,000 lb thrust). Much smaller than the 10,000-lb. first P&W J17 shown it is understood to weigh 1,000 lb less. But for every angle Orpheon, scores of J77s exist.

Armstrong Siddeley's price visible was the new Sapphire 7, of 10,200 lb thrust, compared with 5,600 lb for the ML 64 in service.

Built-Baron showed an Atom R. A

AVIATION WEEK, July 16, 1955

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Engineers & Physicists

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23, of 10,000 lb thrust. Its compressor system is built much in common with that of the Supercar. Also open to sale is the new short-haul (30-35 hr). Seat model and seat system, a simple tube-275 lb in weight, 134x7 in., 1,360 lb thrust.

Small Planes, Small Engines

One of the great trends of the show was a return to small, inexpensive and simple and cheap.

This is evident in the French approach to get taken compared to these great efforts of oil and fuel in the same field. (Incidentally, the Comoros are extremely interested in the Fouga Magister and have been thoroughly evaluating it.)

The French began under discussion were interested for a new series of French light military aircraft. Originally single-engine, now are now being revamped to two-engine design, probably in light of the power of single-engine design competition (the Comoros and the Fiat G-91 are both two-engine powered).

A multitude of light fighter designs was shown—two are summarized below. • **Bugout.** The firm produced a light design hoping for a NATO order, which went to Fiat. The Vase (Bosch 73) design had been selected but other considerations overcame it.

Using a single Bristol Olympus, the T-20 is a conventional winged fighter with two lateral intakes. The wheels retract into the fuselage. Van om statement can be long under the wing.

During much in common with the T-20 is the Bugout 1100 selected by the French Air Ministry. Bugout wings (41 deg) are similar for both plans. The 1100 is a bit larger and has two unpowered wings of the new French class. It should fit at the end of next year.

A larger model is the Type 948, of which a small experimental model is being built. To side view, it resembles a C-130. Head on, four large low-wing propellers drive the T-20. The 450hp turbo engines cover the whole wing of the 948 with aluminum. Full-span variable slatted flap covers the stream to a powerful downwash, which is a closed will get the plane into the air in under 60 yards, 1/4 in. lift.

• **Donnell.** A model of the Mistr 22 was seen to have a lot in common with the Brigard 1800. It was also quite conventional, with lateral intake feeding the light twin engines. The French Navy is reported interested in this plan.

Donnell also has plans for the Mistr 24, powered by a single Olympus. Another light Donnell fighter is the M D. 550 now being and nearly



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study to fit. No plan was shown, but the aircraft is understood to weigh around 5,000 lb, and be of dual engine. It will use two M.D. 30 Vigors, in which Donnell went to add advantages. The M.D. 550 (named Donnell), after the legendary named of Donnell will be level sequence, says Donnell. The Mistr 22 and 24 carry two 3000hp Hispano engines, as far as ground attack, but 325 was no direct gain. It is reported the 550 will be tested with missiles. All three phases, it is claimed, will get off and on in 1,100 yards using gross weight. • **Suzuki.** A lighter version of the Air powered Comet seen flying at the show

is designated the 1921. Except for a delta front end, a weight something under 15,000 lb, little could be named. • **Fiat.** The Olympus-powered G-91 light fighter selected by NATO was shown in model form. It is virtually a delta 7-46K as made by Fiat. • **Colapucci.** Another wing. Bug bars are the part of engineer Zbrowski. Sectors has for some time been working on these ideas. Colapucci military and civil designs, as well as guided missiles, are being studied. With constant development, vertical takeoff ability and high speeds, the Colapucci is a serious work interest in France. • **Lecher.** Shown a very interesting

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PHOTOGRAPH

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been of contract in and on his 021 engine engine-part of a wing. This was a beautifully finished top wing motor with long elegant spars and struts. The interesting thing about this 150-hp engine was that it was produced by an ordinary wing spar rolling machine. Relatively narrow sections are so machined, then bolted together spars along a large machined flange. A few ribs of heavy section are fitted.

The wing structure of the T-100 was shown to be of the sandwich type—aluminum foil between heavy top and bottom skins.

Accessories & Equipment

The French aircraft industry has advanced rapidly with respect to the vast amount of accessories and equipment of a varied nature needed to produce modern aircraft.

France now produces over 50% of the equipment of her airplanes. Gone are the times when powerful French planes used vast quantities of American, British and German equipment.

French equipment is of excellent quality and design. Her master control consoles were some of the first used in quantity in Europe. French fighters had full power controls when British were still hoisted. The Super Mustang has a powered slab tail, and the T-100s have powered tail controls. For heavily maneuverable during the long part of the show was the precision and accuracy of control of the French aircraft. In the respect they appeared to match their British counterparts, and rival, if not better, the latter.

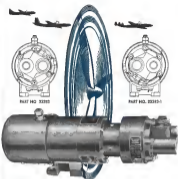
French electronics and radar are particularly good, and new applications were seen at Le Bourget.

First was a form of 3D radar location which is made by the use of RVS & RI.

It does with one set what formerly required two or more installations. It provides two adjacent arcs on one of which the operator sees the second ship which provides bearing in azimuth and also shows movement. The second screen shows range and slant, as line model and vertical line of sight. No computations are required and there are no reading time lags—dead for manual, lag-free control, etc.

Second of the equipment is an AM antenna rotating 360 deg in azimuth with the reflector, but fixed vertically. Inside is a small rotating beam projector, the movement of which drives out 800 pulses a minute up and down the antenna. Radar the six feet ahead is covered with a vertical up-and-down-sweeping, pencil beam-like stepping grid on a board inside.

Another use of radar was shown as a demonstration using a novel display type called television set. As clouds



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Light weight, winding action, safety wire 25 wires as thin as .001 in. required for use. Serves as much as \$440 per meter automatic.

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Size cutting, all tempered blades. Permanent setting bearing, no adjustment.

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Write for details including prices, testimonials and list of users. **ROBINSON C. ROBINSON CO., Box 494-503, North Sacramento 15, Calif.**

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*Includes cost of tank, pump, control, and wiring. Write today for more information. Give name of aircraft.

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transmit "cannon" photographs the display tube which is transmitted over a civil television network. The situation can then be studied in daylight on our television screen. Several officials and control rooms can be provided with traffic information utilizing only one video setup. Moreover, employing afterglow tubes, information and traces can be retained for up to half an hour. In the demonstration, the television screen southeast of New York was broadcasting the entire air traffic picture 30 miles around New York in 10 seconds.

Spinal television was also shown. In stead of the screen pointing the picture at its west coast, the "pointing" concentrated round the entire periphery of the tube and worked around to disappear in the center. Spinal scanning and projection in television was also shown. On the screen the bird scene could be magnified or reduced from the full screen size to one down to the size of a quarter in the middle of the tube. Focus and clarity occurred. Surroundings in color and in some fields clearly leads the rest of Europe. The television continues these sophisticated resources are answered for its accuracy. They are widely used for prototype instrumentation.

The show proved that the continent of Europe can design and build modern civil and military airports, and missiles too, of which several were shown though not much was given away. The same is true of pilotless targets and missiles, such as the French Nord target, the CT 30 (based on a ramp, jet-powered, and jet subsonic).

There is now a chance of world peace designs in the military and civil fields, though heavy bombers and large transports are notably lacking, due to a shortage of funds.

There is protection—limited only to lack of funds and lack of thinking. And there are designs for the automatic future as well as long-term products. To these can be added what Britain is undoubtedly doing to show it her own Eisenhower display in September.

Americans, perhaps, have had a bad day to discount European strength and capabilities. It is the past they have been paralleled, but this year for the first time since the war things are really looking up.

The contract's own industry with American help has justified itself and is standing largely on its own feet even though on a small scale be U.S. standards.

This is the third and last of a series of special reports to Aviation Week on the 25th International Show of Aeronautics by William A. Winstanley, former British journalist and air correspondent of the London Daily Express.

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Lightest, lightweight Fairchild J44 turbojet engines provide "extra-engine" safety power for re-engineered aircraft — "extra push" for those military and commercial transports which mean easy higher payloads and yet operate safely under marginal weather and terrain conditions.

These 1400 lb. thrust turbojet engines provide thrust for one pound of engine weight. They give big engine performance in small, compact packages — they are low-cost, easily serviceable engines. Fairchild J44's are now completing 150-hour military and commercial qualifications for industrial service. Performance in military transports, guided missiles, target drones and other specialized installations since 1958 has provided substantial operational experience. J44's are reliable and economical to operate. They are leaders in the small turbojet engine family.

Variable J44's are Fairchild Engine Division's answer to transport operators who need immediate, AVAILABLE lightweight power boost for specialized applications. Newer and more compact power packages are being designed and tested for tomorrow's military and commercial requirements.

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Engine Division

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*Including J44-F10, the Fairchild power boost gives the extensive loading of thousands and millions of tons — air, sea, land or water.

Fairchild J44 wing tip thrust assist power proved highly successful during extensive evaluation flights on a Fairchild C-123B assault transport.

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ENGINE OVERHAUL

For aircraft engine overhaul service, Pratt & Whitney Aircraft's Airport Department is "home" for every type of business aircraft. Like many of the nation's leading companies, you can enjoy the advantages and reassurance that go with engine work performed at the factory. It can cost less, too, in the long run.

PARTS REPAIR

Certain types of engine parts repair, such as rebarreling cylinders or reworking conrods, require factory facilities and factory methods that are available to you at the Airport Department. Complete equipment for all possible parts repair jobs—large or small—insure prompt dependable work.

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Expanded service hangar facilities can accommodate even the largest commercial aircraft. Service is prompt. Regular work includes inspections, engine changes, major and minor repair, surface repairs or modifications, and general aircraft maintenance.

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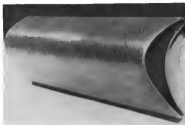
The KEYSTONE 3-POSITION INDICATOR, at present, is being used on aircraft to report more than 60 operating situations. Simple, easy to read, hermetically sealed, reliable, it will report any variable that can actuate a switch mechanism.

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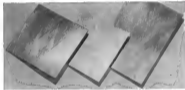
Name _____
Firm _____
Address _____
City _____ State _____



POROSOLY FLAKE at left was made from sintered cylinder. Part at right, based on Flare sheet, is welded on left edge.



FILTER for F-4D 1. Stray has also added threaded flange. Porosity patterns may be varied (right) to change properties.



New Sintered-Wire Porous Metal Shows Promise for Aviation Use

By Irving Stone

Los Angeles—A new porous metal sheet, promising possibilities for aviation applications such as high temperature and cooling, filtration and bonding, was developed by Porosol, Inc., a subsidiary of the Lockheed Aircraft Corporation.

Porosol was developed under Army Ordnance contract at CalTech's jet propulsion laboratory, where it was created by H. L. Wheeler, Jr., formerly of the lab, and now president of the manufacturing company. Also associated in the development of Porosol was Dr. Paul E. Dwyer, former head of the lab's materials department, now professor of mechanical engineering.

Materials & Methods

Porosol may be made in
•Large flat sheets with a wide range of thicknesses.

- Large seamless parts such as cylinders and cones
 - Long (drawn) tubes ranging from 1/8 to 12 in. in diameter
 - Metal coatings of stainless steel, Inconel, Monel, copper, brass and many others
- Because of Porosol's ductility, it may be fabricated by cold forming, drawing, stamping, spinning or rolling. It may be painted, lacquered, and welded (MIG, TIG, or resistance).

Production Items

A production application for Porosol is on the Douglas F4D-1 Skyway. Here it is used in the hydraulic system as a control filtration unit with ability to withstand high pressure drops at high flow. The part is a tubular configuration about 2 in. long and 9/32 in. in diameter, with a 1/4 in. diameter flanged flange silver-soldered to the tube. The flange screws into the control valve for a control valve.

Another production filter element

Introducing the NEW "J" Model...

JETCAL ANALYZER

CHECKS ACCURACY OF
JET ENGINE **RPM**
and **EGT** SYSTEMS



With NEW...

- 1) Tekcal
- 2) Potentiometer
- 3) Roggized Gages
- 4) Test Circuits

9 Of the many factors affecting jet engine efficiency, fuel flow operation, T₄ and T₅ are primary jet engine (JEP) factors. Even fuel flow "meter" can be as much as 50% and low EGT (exhaust gas temperature) will make operation of the aircraft less costly and dangerous. The JETCAL Analyzer provides accurate accuracy of the EGT and T₄ and T₅ systems and makes errors if they exist.

JETCAL
ANALYZES JET ENGINES 10 WAYS!

10 The JETCAL ANALYZER, Jet-Aerodyne Inc., has the EGT thermocouple circuit of a jet engine or turbine engine engine for after without running the engine or engine (T₄ and T₅ are engine fuel temperature).

11 Checks electrical thermocouples "on the bench" (check electrical on jet engine).

12 Checks thermocouples within the harness for continuity.

13 Checks thermocouples and positioning harness for accuracy.

14 Checks presence of the EGT circuit without the EGT (exhaust).

15 Checks isolation of the EGT circuit from other systems (T₄ and T₅ are engine fuel temperature).

16 Checks EGT system with engine removed from aircraft (no problems for or aircraft).

17 Checks electrical TACHOMETER system accuracy to within 40-100 between 500 to 1000 RPM.

18 JETCAL ANALYZER enables engine placement to proper relationship between engine temperature and engine RPM for maximum thrust and efficiency during engine test (T₄ and T₅ are engine fuel temperature).

19 Also, Jet-Aerodyne, checks aircraft thermal engine (T₄ and T₅ are engine fuel temperature) and engine (T₄ and T₅ are engine fuel temperature) using JETCAL Analyzer.

How to establish an EGT (T₄ and T₅ are engine fuel temperature) and engine temperature (T₄ and T₅ are engine fuel temperature) using Jet-Aerodyne.

B & H INSTRUMENT CO., Inc.
1007 Norwood • Fort Worth 7, Texas

SEAMLESS POROLLOY tubing could be used for such things as line filters, fuel streamers in gas diffusion.

• Composite particles in hydraulic system.
• Boundary layer bleed surfaces for reduction of turbulence and shock wave formation in regions of air intakes on high speed aircraft.

One advantage of the material in this application would be its ability to be fused in compound curvature.

Other possible benefits, in jet applications include: wear loading edges, air streamers protecting the leading edges, and flap leading edges.

Surface smoothness of the sheet would vary directly with material density and indirectly with wear diameter.

A Porelok 10-micron filter element is under development for hydraulic system service, to withstand high test pressures generated by environmental conditions. Based at overcoming the temperature limitations of paper filter elements now used, the unit is planned for aluminum-steel making proposed to meet AN-ETC 1000.

While an obvious development has been begun for a sheet-processor application, the material could be used in an air-cooled blade form to defeat the exhaust gas stream.

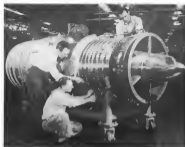
The company also is working on classified projects for such organizations as Raytheon Aircraft, Spangfield Aircraft, Office of Naval Research and National Advisory Committee for Aeronautics.

Porolloy Properties

In contrast to softened powder porous metals, the company said, Porolloy has a higher strength for a given porosity. Its porous construction also has a higher ductility because the continuous strands of base wire help carry applied loads.

Strength of the structure is closely related to the wire cross-section angle. When Porolloy's strands cross at 90 deg., the material exhibits a uniform strength in all directions.

At the enclosed cross-section angles are



P&W Prepares J57 for Smithsonian

First experimental model of Pratt & Whitney Aircraft's J57 turbojet engine gets last adjustments before it was shipped to the Smithsonian Institution in Washington for permanent display in the National Air Museum. Built in 1946, the design is a forerunner of the J57 that won the Collier Trophy two years ago. P&WA has two other engines in the Smithsonian: the original four-cylinder Wasp designed in 1925, and one of four 28-cylinder Wasp Major engines from the B-36 Superfortress.

changed to an acute and an obtuse angle, say 35 deg. and 145 deg., the strength will increase in the direction of the line bisecting the small angle and decrease in the direction perpendicular to that line. Therefore, materials with different rigidity between two stress strengths can be produced.

Strength also is related to other factors such as the basic metal, degree of cold work and type of pattern.

Choice of pore path depends largely on the use of the end product, the complex reports. Strength, pore direction, flow rate, pressure drop and elongation ability are factors to be considered in selecting the pore path. Four configurations include: through, angular, and zoning.

Scrap Used for Dies

Scraps of 5100,000 annually in the manufacturing using melted down aluminum chips as the foundation for large dies instead of new alloy. Kalsbein are reported possible by Lockheed Aircraft Corp., Burbank, Calif.

The new machine gives three to five times less metal cost in less and less metal is needed.

Other advantages include lighter tools and better efficiency when the reclaimed scrap aluminum is used with epoxy plastic being.

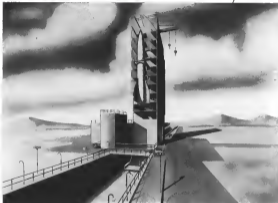
miles of extrusions!

Our extruders have turned out enough plastic and rubber extrusions to reach to the moon and halfway back. In accomplishing this vast enterprise General Tire's Industrial Products Division has supplied thousands of original equipment manufacturers with just about every known type of extrusion. No job is too large, too small or too complicated for our design and production staff. Perhaps you can benefit from the fine tire extrusions extruders we've accumulated down through the years.

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ARCHITECT-ENGINEERING DIVISION

ELECTRONICS DIVISION

PRODUCTION BRIEFING

► Douglas-Saiki Motors, Inc. named C. Ishii & Co., Ltd., Osaka and Tokyo, as its commercial sales representative within Japan. Ishii will do a preliminary marketing survey and arrange sales participation for Douglas commercial aircraft and parts. The firm also represents Douglas military products in Japan.

► Lockheed Aircraft Corp.'s Group Division, Marietta, has awarded a contract to Wixom, Co., Chittanooga, Tenn., to produce C-130A wing flap track rib assemblies. Lockheed-Marietta has received an order from Sikorsky Aircraft to make upper klixon seal subassembly tools.

► Goodyear Aircraft Corp., Akron, is constructing a \$1 million engineering and research building scheduled for occupancy by next summer. Modern facilities and improvement of other Goodyear aviation facilities is also planned.

► Garrett Corp., Los Angeles, has named new foreign sales representatives Nippon Machinery Trading Co., Ltd., Tokyo, and Sorendra Aerospace Distributors, Bangalore.

► Koppers Co., Inc., Pittsburgh, has purchased Kuebler-Hahn Co., Inc., Philadelphia, maker of mechanical parts for gas turbine rotating shafts. The operations will be operated as a department of Koppers Metal Products Division, Baltimore.

► Progress Research Corp., Santa Monica, Calif., has received a \$104,000 contract from Douglas Aircraft Co. for air-dryer fuel turbine pumps.

► Strydomathias, Inc., has moved executive offices from Garden City, N. Y., to its Eastern Division, Post & Street Ave., Waltham, N. Y., and Western Division, 17500 Aratane Blvd., Hawthorne, Calif.

► Mohay Chemical Co., St. Louis, plans full-scale production in October of isocyanate chemicals used in production of urethanes such as flexible and rigid foamed plastics, wire coatings, paints, urethane rubbers and adhesives. The firm is building a plant at New Martinsville, W. Va., to test out the chemicals.

► Minnesota Electronics Corp., a subsidiary of Librascope, Inc., has moved to 111 E. Sixth Ave., Berkeley, Calif., from St. Paul, Minn.



...the New
KLIXON
Simul-Trip®
Three Phase
Trip-Free Aircraft Circuit Breaker



Here is a new thermal-type polyphenyl chloride breaker (D-0700) for aircraft, employing three electrically separate, independent mechanisms with three air-cooling ducts.

5. KLIXON SIMUL-TRIP® circuit breaker action... involved in any one or more phases will trip all three mechanisms simultaneously.

1. Single button reset... restores all three phases simultaneously with one button control operation.

2. Fastest KLIXON type reset trip mechanism... this NEF-1 is 2 milliseconds trip time on short circuit interruption.

4. Designed for top performance... limits IEC 1001 and IEC 1017 type conditions, this breaker is designed to meet MIL-C-1829 requirements.

*Breaker applied for

3. Thermal type naturally... to help maintain weight aircraft circuits deliver maximum safe power at service altitudes with full protection on the ground.

This breaker is now being tested for production in ratings from 3 through 35 amperes. Send for advance technical bulletins — KLIXON — the original aircraft circuit breaker.

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METALS & CONTROLS CORPORATION
SPENCER THERMOSTAT DIVISION
207 FORT ST., ATTLEBORO, MASS.

WHO'S WHERE

(Continued from p. 9)

Changes

Kent M. Campbell, assistant manager Dayton office, Career Division, General Dynamics Corp.

Vernon B. Dugger, section engineer, Ray Controls, Inc., Milwaukee, Wis.

Charles F. Hervey, customer relations representative, Pratt & Whitney Engine & Airplane Corp., Prattville, Ala.

Robert J. Daport, maintenance district manager, Air Force.

Carl Hunter G. Mason, chief of quality control, Oklahoma City Air Material Area, Tulsa, Ala.

George H. Buckner, director of contracts, Northrup Corp., Northrop Aircraft, Inc., Hawthorne, Calif.

Sam S. Nadelmann, U.S. passenger traffic and sales manager, Service National Agency, operations manager, Service N.Y. International Airport.

Chloe G. Benowitz, purchasing agent, Lockheed Aircraft Service International, N.Y. International Airport.

Robert F. Goss, sales manager, Topp Industries, Inc., Los Angeles, Calif., also projects and industrial firm.

W. A. Mason, general sales manager at Duke Irons Corp., Gardena, Calif.

Joseph F. Lutz, assistant of Air Transport Association, Air Navigation General Director.

Lutz formerly was deputy chief of operations for Civil Aeronautics Administration in New York.

Arthur T. Curran, public relations director for General Aviation.

John A. Chaudry, manager of aircraft publicity, consultant for Kaiser Metal Products, Inc., Detroit, Pa.

G. C. Roeder, manager of restaurants and night offices for Trans World Airlines.

Chris R. Lutz, Jr., import lighting representative for Zylman Electric Products, Inc., New York.

Norman J. Jansville, project engineer for overall jet fuel studies, Defense Manufacturing Co., West Des Moines, Iowa.

Raymond H. Williams, aviation sales manager for Chrysler Inc. & Kaiser Corp., Buffalo, N.Y.

Rudolph Finner, vice president-manufacturing and engineering at ACF Industries, Inc., New York, and president of the Western Energy Products Division.

James A. Stedler, vice president general manager of General Metal Products Corp., Glenside, Pa. N.Y. Other changes Edmond D. Holland, vice president John F. Corcoran, leading gas engineer.

Henry H. Lindgren, vice president-manufacturing and Ronald F. Zoske, vice manager of Kinross & Trecker Corp., Milwaukee.

Edward J. Peak, chief project engineer and Manager General project engineer, Allied Research Associates, Boston, Mass.

Martha M. Tinkle, technical coordinator superintendent for American Trade Airways, Bensenville, Ill. Other changes Ray, a newly created post.

Glenn A. Koffin, executive staff and director of flight operations, Atlantic Aerial Ferry Corp., Lansing, Mich.

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EQUIPMENT



SHAFT CHAMBER, where shaft-propeller decouples at base of Auxiliary Machine in Flammable power unit. 1. Fuel line, 2. Turbine separator nozzle, 3. Chamber pressure tap, 4. Ignition coil, 5. Chamber extension about 2-in. diameter by 5-in. long.



MODEL #1 electric hydraulic power unit: 1. Reaction chamber, 2. Alternator, 3. Flammable gas port, 4. Magnetic amplifier speed control, 5. Propellant tank, 6. Hydraulic pump drive, 7. Pressure regulator, 8. Compressed air regulator for checking out the unit.

New Power Packages for Missiles

A new line of guided missile accessories is in pilot or prototype production in the shops of a new entrant in the field—American Machine & Foundry Co.'s Turbo Engineering department.

The organization was set up by AMF to specialize in research and development of compact, high-output combustion devices, but as turbochemists and other equipment related to guided missile accessory power supply.

The company already is involved with Radio Corporation of America in the development of a new air defense missile seen as a Nike replacement (AW March 28, p. 11), and currently

produces marine test and ground equipment.

AMF set up the new division in Providence, Calif., in the latter part of 1953. Today, four different guided missile power packages are either in pilot or prototype production.

The eleven-psi high-output gas turbine, driven by small rocket nozzles which provide shaft power to drive alternator and hydraulic pump.

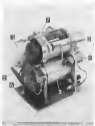
Current power packages are in the 1 to 10 hp range. AMF is working on a 15-hp unit and future plans on compact units of much larger horsepower and much better fuel economy.

according to J. Golden, director of the Turbo Engineering department.

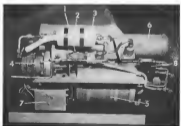
Hydraulic-Electric Package

The first accessory power unit, Model 25, is now in pilot production. It is a complete guided missile power unit capable of supplying either hydraulic or electrical energy. It is approximately 6 in. long, will fit into a 6-in.-diameter tube and weighs 12 lb., including fuel and hydraulic fluid.

Controlled rate flow cylinder are the gas turbine phase motor, its linkage and pumping plant—in this sequence, strictly the regulated output of a high



MODEL 300: 1. Chamber, 2. Propellant tank, 3. Alternator, 4. Pressure regulator, 5. Exhaust, 6. Turbine, 7. Propellant control.



MODEL 171: 1. Hydraulic pump, 2. Reaction chamber, 3. Propellant tank, 4. Turbine assembly, 5. Hydraulic pump, 6. Hydraulic propellant pump, 7. Magnetic amplifier speed control, and 8. Hydraulic regulator. Curb weight 40 lb.

prevent nitrogen bottle-regulator devices, start-stop switches, as well as all the apparatuses of a hydraulic system—positive displacement hydraulic pumps, high and low pressure hydraulic tanks, etc.

A 4-1 gear box reduces the 45,000 rpm turbine shaft speed to 12,000 rpm for the hydraulic pump.

Propellant tank fuel duration is 44 seconds, of which half is full power duration. The 12,000 rpm hydraulic pump delivers 0.6 gpm at 3,600 psi.

Turbine speed control is held within 23.5% under a wide range of loads.

The environment-free, completely regulated package also contains conven-

ience equipment for various electrical power outputs.

All-Hydraulic Unit

A prototype for a larger all-hydraulic power package has been built by Turbo Engineering, Calicut Model 171, the unit demonstrates weight saving made possible by using a larger machine instead of a static type of power source such as an accelerometer.

This AMU package weighs a total of 99 lb., including propellant and hydraulic fluid. The accelerometer it replaces weighs 175 lb. The power pack delivers 12 gal of oil vs 1 gal for the accelerometer.

The power package is approximately 12 in. square and 30 in. deep. Output is 2 gpm at 3,600 psi. Duration: 6 min.

Space-Limited Unit

AMU has another electro-hydraulic power package also a prototype form—the Model 41.

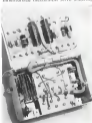
The unit is made up of two cylindrical structures about 15 in. long which together occupy 170 deg of a 16-in. diameter circle, enclosing the seven design constraints imposed on this type of equipment.

One container houses the propellant and pressurizing gas tank, the other the active assembly. The latter is a 490-cycle, 1,700 rpm precision magnet type oscillator (output is 12.5 l) directly connected to a 4 1/2 in. diameter turbine operating at 74,000 rpm. In addition, a 4-1 gearbox gear train drives a hydraulic pump at 6,000 rpm, providing a hydraulic output of 35 lb.

Golden points out that packaging and space limitations dictated turbine's outside diameter while simplicity of control dictated its size. It is directly connected to the 24,000 rpm turbine going relatively low turbine efficiency. However, "this is the highest turbine efficiency obtainable under the design constraints imposed and which would meet the overall package weight requirements," Golden says. Power pack weighs 35 lb. dia. and 39 in. to feet.

Dual Electrical Unit

The fourth power supply—a prototype—is a composite electrical system. Dual output is 4,000-cps power for noninterfered mechanical wave systems.



SPEED CONTROL is the name of a simple (almost) modular system. Magnetic amplifiers (magnetic core) is used in conjunction with a solenoid valve which controls propellant flow and flow of hot gas from the generator. Unit has no delays or lags.

NEW HIGH ALTITUDE MAGNETIC RECORDER

THE AIRBORNE AMPLEX 800 records the broadest combination of data ever obtained concurrently on one magnetic tape—performs under all high altitude environmental conditions—and furnishes data compatible with the most widely used playback equipment.

HANDLES ANY AIRBORNE DATA REQUIREMENT

The Ampex 800 can provide from 1 to 28 data channels. By interchangeable amplifier units, each one can be adapted to any one of three basic magnetic recording techniques:

Direct recording—300 to 35,000-cycle response for a wide-band data or multiple recording of 300 subcarriers.

FM-carrier type recording—D.C. to 5000 cycles and high instantaneous accuracy suitable for shock and vibration data.

Pulse-width modulation recording—Up to 30 instantaneous readings commensurate on its each tape track; frequency response 0 to 2 cycles/sec.

Combinations of these recording techniques can be provided to satisfy practically any flight test requirement by simple insertion of the proper plug-in amplifiers. Separate channels can be assigned to measurements requiring wide-band response or high transient accuracy. By using pulse-width techniques, many relatively steady instrument readings can be commensurate on a single channel. All will have a common time base.

WITHSTANDS THE RIGORS OF HIGH ALTITUDE FLIGHT

The Ampex 800 will perform within specifications under vibrational forces as high as 10G—operates over a temperature range from -40°F. to +130°F.—is altitudinally rugged to 50,000 feet—and withstands a relative humidity of 100% up to 122°F. The Ampex 800 is light in weight, it operates on 27.5 volts D.C. and 115 volts, 400 cycle, A.C. All operating features can be accurately controlled.

RETAINS WIDELY ESTABLISHED RECORDER STANDARDS

The majority of all magnetic recorders now in instrumentation use are Ampex machines. Their recording characteristics, tape speeds, track widths and other parameters have become a standard in aircraft and missile testing. The Ampex 800 retains these standards while greatly extending the environmental and mechanical conditions under which accurate test data can be gathered.



Performance specifications, descriptions and explanations have necessarily been limited by the space on this page. A full description and detailed specifications on the Ampex 800 are available by writing Dept. UAU-2343.

First in Magnetic Tape Instrumentation

BRANCH OFFICES: New York, Chicago, Atlanta, San Francisco, Dayton, College Park, Maryland (Washington D.C. area).

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AMPEX CORPORATION
SANTA ANA, CALIF. 92705

4 out of 5

**helicopters under 400 hp.
produced this year will
have power by**

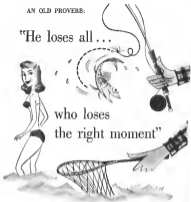


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who loses
the right moment"



This is a good time to consider whether or not the moment has come for you to make the change in your employment that can mean the beginning of a successful, productive and happy future.

Opportunities are outstanding right now at Fairchild Aircraft Division, for experienced aerodynamicists and designers looking for interesting, progressive work in the forefront of aviation design, research and development.

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"where the future is measured in lighter-years"

reasons for guided missiles? Turbo Engineering believes that for many applications the hot gas turbine turbine better other possible power sources in these important parameters it is lighter, smaller, and its output is easier to control in the precise references required by guided missile electrical and hydraulic systems.

Other possible sources of necessary power for guided missiles include:

- **Main propulsion engine**, if it has a rotating shaft. The emergency unit concept developments indicate that future needs for emergency power will require clear regulations that it is possible to derive from the rotation of the propeller shafts that can be "interconnected" high weight and speed penalties are paid by main engine speed regulating devices.

- **Static devices**, such as electric batteries or hydraulic accumulators. In the most recent of the static, an auxiliary motor in a one shot missile system, but AMF classifies the accumulator with the battery as a static device for comparison.

These sources are quite reliable, says AMF, but they tend to be heavy.

- **Blind air turbine**, which uses air bleed from the main propulsion engine's compressor section. This source of recovery power is simple and reliable.

Drawbacks are that turbines have to operate under a wide range of pressure and density ratios, making them difficult to design. Users have to be large to produce desired output at high altitudes. Also, bleed air turbines produce turbine engines by starting compressor air, thus increasing jet's fuel consumption.

- **Ram air turbine**, which uses the ram pressure around an external turbine as a driving power source. Although relatively simple and very efficient under certain circumstances, ram turbines often present their own problems. Because a turbine must take off at low speeds in high density air, it at high speeds in very reduced air and density at high speeds in increasingly dense air, the dynamic load through which the turbine must travel often becomes death—as much as internal heating to air. Yet, the turbine's electrical and/or hydraulic systems require precise power output regulation—especially as light as 1%.

Ram air that control problems become extremely complex. AMF says that the throttling problem is becoming a critical limitation of air turbine used in guided missile power sources.

Second drawback is that the "weight" of the turbine includes not only the turbine itself but also extra fuel needed to offset drag caused by turbine and its ducting during the missile's initial lift-off.

• **Hot gas turbine**, says AMF, provide an ideal solution to the weight prob-

Emergency Power

Latest application of Turbo Engineering's rocket-driven emergency power pack gets a temporary power supply for underwater launch of guided missile.

The hot air turbine engine is used to provide either emergency electric or hydraulic power or both in case the aircraft's normal system fail.

Sufficient heat is provided to operate the power package for at least twenty minutes to enable the pilot to establish communication, negotiate with electronically driven instruments and operate such hydraulic systems as lower his landing gear.

less usually associated with static power packages and floating examples, then involved in ram air turbine, static turbine.

AMF deems its pressure by liquid nonpropellant rockets as gas turbines. (Nonpropellant are characteristically unstable liquids which decompose in a rocket motor, providing hot gases.)

The complete new turbine made which decomposes into methane and carbon monoxide, both of which are combustible and can be burned with its available. Some AMF units derive their power from the decompositional products of propellant and other light sources which usually decompose into fuel-rich gases.

Gases are not burned in AMF's unit, so power supplies which are effective.

Instead, the nonpropellant decomposition occurs under high pressure to release energy by converting the pressure to velocity in a supersonic mode. This high velocity jet is expanded through the turbine at velocities of over 5,000 ft/sec to impinge on buckets, which are of impulse turbine type.

Turbo Engineering says its units are relatively small and simple. But, "if maximum reliable energy were used a control problem analogous to the air turbine problem would be created. A relatively simple device that is relatively wasteful of energy is to be used."

"In AMF units, fuel consumption will run from 6-20 lb/hr. This is quite satisfactory for the limited flight duration of a guided missile. Reasons for that, being environmental fire, complex control are eliminated, and, although heat is liberated rather wastefully, use of ramjet is required to offset its energy is very small."

Other Turbo Engineering activities include participation in classified research in rocket motor combustion and computer-aided developments in new powerpack cycles.



AIR RESCUE FOR A WATER-SOAKED PILOT

Today, a new helicopter for the U.S. Navy. It's the new Piasecki HO4S. Small, compact and highly efficient, the HO4S is an advanced version of the HO4—the first helicopter designed specifically for the Navy.

As its name suggests, the HO4S is a motorized forward fuselage in Piasecki helicopter design and development. The HO4S is the only one of the many im-

portants that will perform for the Navy throughout the world. It is large enough to power itself in higher speed, longer range and greater payload.

This is just another outstanding result of Piasecki Helicopter Corporation's continuing effort to improve helicopter performance — build helicopters that do more jobs and do them better than ever before.

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From pilot stage to production efficiency of electro-mechanical equipment the leaders rely on Atlas "creative engineering." Atlas Precision Products Co., Philadelphia 24, Pa. (Division of Prudential Industries).

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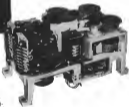


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Actuators for 0-7,000-Lb. Range

Three new, thin package electro-mechanical actuators, the 434 and 435, have been designed to operate in the 0-7,000-lb. load range. Two complementary 437 and 438 models in the series.

Typical envelope sizes for the 434, 434 and 435 series, respectively are 1.5x3.7 in., 2.6x4.9 in. and 3x5 in. Representative weights are 1.7, 5 and 9.5 lb. respectively.

Typical maximum operating loads maintain static loads and ultimate static strength in tension and compression are, respectively: Series 434-500, 1,500 and 2,000 lb.; Series 434-7,000, 4,000 and 9,000 lb. and Series 435-7,000, 10,000 and 15,000 lb.

Voltage requirements are standard 24, 48, 115 v., single phase; 480, 600 v. a.c. at 200 v., three phase; 480 v. d.c.

Loew, Inc., 130 Leola Ave., N.W., Grand Rapids, Mich.



0-60 m.p.h. and gears of 30 d.p. and over have been used to be more useful for lower gears in the same frequency range. dipoles and dipole arms are provided for frequencies down to 100 mc.

Color Television, Inc., 555 E. San Carlos Ave., San Carlos, Calif.



Relief Valve Has Thermal Venting

To control maximum surface oil temperatures as well as pressure, Series EA 50004 oil-soluble aircraft relief valve features a thermal venting system. Temperature control unit has been added to a 5,000 psi relief valve in a switch device to prevent faults from exceeding 275°.

Valve is available for use with 4 or tubing. Full flow rating is 22 gpm at 3,700 psi. Relief pressure and temperature settings can be provided on request.

Vickers, Inc., 1400 Oakview Blvd., Detroit 32, Mich.

Computer for Dead Reckoning

Pocket-size two-terminal electronic computer for flight navigation can be used with maps of any scale without intricate calculations or adjustment. It follows use of a modified logarithmic scale to convert linear distance, as used on a map into logarithmic, increments, permitting an, measured distance to be indicated directly on the course table rule.

The computer is also arranged to permit calculating wind drift, air miles per gallon, range and true airspeed. Accuracy is said to be approximately 0.5%. Representative calculations produce an automatic error, it is claimed. Price is \$15.

Trans-Alberta Measuring Computer, Box 94, Helena, Pa.



Highspeed Mercury Switch

Multi-position highspeed switch acts as a get-ahead-of-someone at the pole or a get-out-of-the-way at the stop. Speeds of at least 10,000 rpm can be achieved and up to 120 contacts per revolution can be completed, it is claimed.

Name is said to be less than 18 in. into 180 slots. Absence of spring-loaded contacts gives long life with no contact bounce, the maker says.

Detroit Controls Corp., Research Division, 1650 Broadway, Redford City, Calif.



Stamp Rate Up to 900 a Minute

Waco Flying Press stamps rolled sheet at production speed of 900, 900 strokes per minute. Card moves continuously rather than intermittently, and upper and lower dies move forward and backward with the speed of the metal strip.

Another feature of the press is that it has neither clutch or brake, drives

IF
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was written for you...



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Whether you're an engineer who needs technical information in a hurry, or a new user of tubing looking for the full story of stainless and high-alloys, you'll find this booklet equally valuable.

In it, discussed by classification, you'll find data on processes, assembly, mechanical, heat-treatment, environmental and other forms of stainless and high-alloy welded tubing. There are engineering data on joining methods, welding techniques, bending and insulation facts. Also included are complete tables of bending pressures, physical and chemical properties of stainless steels and other alloys, and corrosion and temperature data. This is only a partial list of contents, but it will give you an idea of the wealth of pertinent, factual information the booklet contains.

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TRENT TUBE COMPANY, GENERAL SALES OFFICE, EAST TROY, WISCONSIN Subsidiary of CHRYSLER STEEL COMPANY OF AMERICA

usually accounting for much of the down time and maintenance on such machines, according to the maker. Energy is stored in the action of the dies and die holders, rather than a fly wheel.

Units will be manufactured in a range of sizes. Photo on p. 31 shows the 30 ton prototype.

Watts Equipment Corp., Cleveland, Ohio.

Dust Spreader Increases Flow

New airblast spreader designed for topsoil/seed applications gives operators a stated increase over flow 15% over other types. The spreader's angled-shaped nose and gate sections provide maximum vertical air pressure and



flow. The four-position gate is adjustable for high, medium or low directly outward.

In flight tests dispersing 50 lb. of dust, the device gained an indicated spread of 37' mph on a 15-second clear flow, in a 300-psi. Low-pressure, ground-Stresser at 1,500 rpm and 25 in. 14 constant power setting.

Trenchless Co., El Segundo, Calif.

New Tools Due For Showing

Three new machine tools have been developed by Pratt & Whitney Division of Nike Aircraft Prod. They are:

- **BL Koller** Incorporated mils, Ill. 6022, Model C, is known that process Koller types and is designed to take large work. Spindle power is equipped to 10 hp and range of spindle speeds is 34 to 5,440 rpm in 20 steps. Spindle has either No. 12 B&S or No. 30 run taper hole. Horizontal travel is .36 in., vertical travel is 22 in., and traverse travel is 12 in. Work table size is 49x38 in.
- **Vibrotac** mils with 120 hp work capacity has control system that does not touch the wheel and prevents no deflection or mechanical reaction in the track. System is based on a magnetic gap of harmonic high voltage; low-amplitude current between track and wheel. Variations in the gap produce proportional changes in the voltage across the gap. These changes are also directly amplified and used to control magnetic clutch driving the spindle and table movements.
- Vertical position hole guides No. 3E.

KEARFOTT FLOATED RATE INTEGRATING GYROS



KEARFOTT 606 10° FLOATED GYRO



KEARFOTT 2 x 10° FLOATED GYRO

Consistently Accurate

Their output, severely impacted by the random drift is continuously reported in day-to-day operation.

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|------------------|------------------|----------------|-------------------------|-----------------------------|-----------------|----------------|
| 10°/sec 10° | 10°/sec 10° | 10°/sec 10° | 10°/sec 10° | 10°/sec 10° | 10°/sec 10° | 10°/sec 10° |

Kearfott 606 x 10° and 2 x 10° Floated Gyros have basic construction features that impart this all-important reliability. The materials used in their construction are of similar coefficient of expansion, thus avoiding stress imbalance due to temperature changes. Displacement information is provided by an extremely linear AC Vane pick-off. Either AC or DC outputs can be provided. Two additional floated rate integrating gyros, one with a 2.5 x 10° gm. cm/sec. wheel and the second with a 12.5 x 10° gm. cm/sec. wheel are available. Hermetic sealing provides resistance to extreme environmental conditions.

—Send for Technical Data Sheets

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New P&H AC/DC Welder does work of two machines for Douglas Aircraft

... saves time, cuts welding costs, provides new convenience

The very high temperatures and pressures encountered in jet engine design systems posed some new problems for Douglas Aircraft. Instead of aluminum throughout, it was necessary to combine the flammability of stainless steel and titanium alloy ducts with aluminum sections.

Since AC is required for jacking aluminum, and DC for making good welds on titanium and stainless steels, two separate machines were formerly required at each station. But that was before PWS combination AC/DC machines entered the picture. Here's what a company could save:

The development of this construction machine has

provided better quality (greater convenience) and at the same time insured our costs for equipment and labor.

Double-clicks that their welders save money paid with these machines—they change from AC to DC and back with the turn of a switch. They have less spoolage and less leakage. And F&H Dual Inert control provides instant heat selection and an easy quick start-up too.

And you can save money with these versatile AC/DC markets too. See your nearby F&E representative or distributor or write Welding Division, HarbridgeFerguson Corporation, Milwaukee WI 53204.

382

HARNISCHFEGER

the P&H Line

Full safety manual or manualized aid is found in BENT INDUSTRIES MANUFACTURING COMPANY, Inc. Box 1000, Box 1, Santa Clara, Calif.

is designed to grind straight or tapered holes and radiuses. Speeds range from 4,000 to 100,000 rpm. Table work surface is 23x44 in. Work is clamped to the table and does not revolve. Grinding wheel has a planetary motion about the vertical axis of the hole being ground and can be fed outward with a screwing-type handle while the machine runs. This feature permits accurate locating and grinding of any number of various size holes in a work piece without changing the setup, says the manufacturer.

Fruit & Whitney Division, Nike-Beairst-Pond Co., W. Hartford 1, Conn.

Three-Trip Circuit Breaker

New Elcom thermal-type polyphase D6360 circuit breaker features three dielectrically separate high-voltage mechanisms that simultaneously trip should any one of the phases become overloaded.

Single-latch reset reactuates all three phases simultaneously and short-circuit interruption (top-hang) takes one to two milliseconds; the meter reports if it is available in ratings of three through 35 amp. The breaker meets MIL-C-26009.

Spencer Transistor Division, Merrick & Controls Corp., Attleboro, Mass.

Speed Reducers Cut Back-Lash

Miniature speed reducers with servo-motor ends have parallel gear trains that are spring-loaded against each other so continuously take up backlash.

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Van Nuys, California

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Research and development in the technology of guided missiles is not confined to any one field of physics. Broad interest and exceptional abilities are required by the participants. Typical areas at Lockheed Missile Systems Division include:

- Applied mathematics such as the numerical solution of physical problems on complex computers
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- Ballistics and the integration of ballistic type missiles with vertical guidance
- RF propagation, microwave and antenna research and development
- Integration of ground and flight test data to evaluate dynamic performance
- Stress and structures
- Test instrumentation and telemetry
- Advanced electronics and radio systems

Costume design elements are creating new programs for those capable of significant contribution to the technology of guided missiles

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ent thrust ratio from 1.1 to 531:441.1, but speed ratio can be obtained. Nominal 1,800-hp rating is used. Floated over gain are handled to provide long life.

Matrix Instrument Co., 402 Locust St., Denver 5, Colo.

ALSO ON THE MARKET



Multi-head not acting quadcoils come with feet and 12 leads. Some set special needs but by changing the lead rig parts, up to 12 sets of different sets can be set simultaneously—Tuba for Resol & Stud Co., Woburn (Queeny) 78, Mass.

Nes CM-7 chemical for extruding—fuel has been put on the market. Extruder is composed of magnetic elements. Makes CM-7's qualities are comparable or superior to the overall fire-extinguishing qualities of carbon tetrachloride and carbon tetrachloride. Researcher, at instance, CM-7 exhibits formation of phosphorus gas and carbon monoxide—Red Cement, Inc., Red Cement Building, Lufkin, Colo.

Acrylics with-wound precision, polyethylene materials are 4 in. in diameter, have resistance range from 10 ohms to 50K, ambient temperature range 0° to 35C to 121C and weight 8.25 oz. Units are sealed—Aer Electronics Associates, 125 Rogers Ave., Somerville, Mass.

High-capacitance ceramic capacitors are available in five values from 0.005 uF to 0.1 uF and measure 0 in. square maximum to 11 in. square maximum. It is maximum with thickness from 0.001 in. to 0.110 in. Items are normally used from 5C to 40C—Mason Corp., 9 St Francis St., Newark 5, N. J.

Regulated power supply units meet new USAP MIL-E-4154A open for ground electronic equipment. Fixed output and set voltage (adjustable ± 25 v) from 0 to 1,000 v in three current ranges: 300, 600, or 1,000 ma. Regulation is

and to be held to 0.25% over or under and standard output is 4 sec. rise—Nyl Corp., 345 Chicago Ave., Kenilworth, N. J.

Mount 3070 coating area has a 0.66 specific gravity when fully cured and is used from -100F to 400F. The solder spools. Adhesive qualities are said to be excellent—Eaton & Canning, Inc., 161 Washington St., Canton, Mass.

Subminiature relay M-1000 series incorporates a permanent magnet in its electro-magnetic circuit to achieve high inductive torque to overcome high contact pressures and achieve large contacts. Relaxed structure has no grooves, hinges or bumps. Type M-1000 is a pin and socket SPDT relay and M-1000F is the polarized version—Lafayette Manufacturing Co., 7112 Vista Ave., N. Hollywood, Calif.

Servo-hydraulic electric control unit Y790US has been designed for use with Y290UC sliding-mech-type hydraulic fly press to indicate that terminal resistance



ties is correct. Control provides 10-psi from operating at mid. is properly positioned—Bendix Engineering Co., Inc., Newark, Conn.

Slotted metal are available in commercial quantities, in dry, completed units for those wishing to immediate protective coatings. Formulas are R-1461 and R-1407, which may be identified to get combinations of good color, adhesion and rough film built from flexible and more flex-resistant characteristics—Dow Chemical Corp., Midland, Mich.

Outlines suggest wire coatings are and to have higher resistance resistance than other methods. Coatings and need not be stripped before soldering, the material—Nabco Chemical Co., St. Louis 4, Mo.

Vibration indicator series Model 156 has integrating amplifier and a scale reading amplifiers in decibels of 20 in. Filter can pass color-coded color frequency and electronic lower frequency shunting of the ng. Two Elton of different frequency can be inserted at the same time—Western Precision Research Corp., Richland 100 24, N. Y.



Illuminated push-button switch for aircraft and electronic applications, 51P88 has low operating force and high precision. Overall length is 1 1/2 in.—Morgans-Henrichs Regulator Co., Minneapolis Division, Englewood, Ill.

Motor generator of 5 kw, 400 cycles, with rubber motor and magnetic air filter voltage regulator, is built to USAP specs for calibrating, testing or

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N.T. Averb, aerodynamicist (left), E.R. Weype, aerodynamic Department head (center), and C.F. Branson, aerodynamicist, discuss wind tunnel tests in different discussion height of a supersonic superiority fighter.

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AIR TRANSPORT

CAB Orders North American Grounded

Board revokes Letters of Registration for four irregular carriers, charges violations, 'mockery.'

By Craig Lewis

Washington, D. C.—The last of the big unscrupulous aerospace operations lost a vital weapon in its fight to stay in business when the Civil Aeronautics Board voted today to revoke the operating authorities of the North American Airlines carriers. In a complicated legal decision, CAB found that the individualized companies involved in the Transwest Express case—Twentieth Century Air Lines, Trans National Airlines, Texas American Airways and Hemisphere Air Transport.

The CAB also revoked the Letters of Registration of the four irregular carriers flying under the North American name—Twentieth Century Air Lines, Trans National Airlines, Texas American Airways and Hemisphere Air Transport. The decision isn't expected to affect North American's operations for the time being, since there are some legal steps the troubled carrier took, such as its efforts for reauthorization from the CAB and review by the Court of Appeals, before it becomes really final.

Four Reasons Cited

In its findings, the Board described four separate bases for revocation. Taken together, the Board finds these violations make revocation inevitable.

• Participation in a conspiracy to operate in unauthorized district, frequent and regular air transportation.

• Collusion in carrying of cargo for two years and, in violation of the Civil Aeronautics Act.

• Individual and collective advertising and operation of regular and frequent air transportation.

• Violating provisions which violated the CAB economic regulations.

The CAB also found that the four principal individuals involved in the case—Stanley D. Wynn, James Frey, Jr., Jack B. Lewis and N. B. Marshall—deliberately acquired control of the four irregular, merged the properties without board approval and, together without honest cooperation, operated a single, integrated air carrier without a certificate of public convenience and necessity.

In its opinion, the Board accuses North American of trying to avoid the consequences of illegal activity by cleverly avoiding legal doublets as to whether their conduct was unlawful.

The CAB said: "What we cut through the web of subterfuge, dealing and technical devices employed by the respondents, it is perfectly clear that the respondents have attempted to make a mockery of the Board's regulatory and to operate without regard for the requirements of the Civil Aeronautics Act."

No amount of pious protestations by respondents can wipe away the fact that this deliberate fraud, upon an involved scheme to operate a single scheduled transcontinental air transportation business without a certificate of public convenience and necessity in other appropriate operating authority.

Activity Is 'Unlawful'

CAB said that North American attempted to give a semblance of propriety to their operation through the use of four different Letters of Registration held by four ostensibly independent irregular carriers.

But the Board said that "the independent character of these companies was null and void, and the alleged status of these carriers was merely a mere ploy to conceal the identity of the true owners."

In a rare and rare, the individual respondents herein were, respectively, manipulating their controls over their different enterprises to maintain the appearance of separate operations in each carrier response, while in fact engaging in irregular scheduled air transportation as a single company.

"And now," said the Board, "with

the same degree of legal ingenuity employed in connection the North American case, respondents have resorted to a multiplicity of technical legal arguments in an attempt to escape the consequences of their unlawful activities."

In answer to North American claims that regulations the carrier is opposed to have violated are created because they were promulgated without adequate hearing, the CAB said the attack on the regulations is a mockery designed to circumvent the "notice-and-comment" rule.

"The Board concludes that Wynn, Frey, Marshall and Lewis are engaged in direct air transportation. These respondents are actually handling the transportation through their own representatives and not merely undertaking responsibility to see that the transportation will be provided by others, as in the case of a freight forwarder or express company."

North American contended that a CAB examiner gave consideration to the compliance proceeding out of fear ahead of the New York-Chicago case, in which the carrier is an applicant. CAB said that the receipt of North American's certificate application, and no advances to the compliance case, and that the carrier has no legal right to force an administrative decision in its certificate application.

Others May Follow

"Apparatus," said the Board, "Respondents cannot claim that they applied for the certificate in their proceedings, they are, regardless of the outcome of such proceedings, less able

Home-Owners Quieted

Port of Seattle, operator of Seattle-Tacoma International Airport, has made some headway in a struggle against nearby homeowners who have been making a court order to prevent planes from being less than 100 ft over their property.

Half of the 10 residents withdrew their action for a court order after the airport and it would purchase their property for use as a flight corridor. Rights of the 10 whose property is not within this proposed flight corridor will be determined in a court at a later date.

A recent New York Federal District Court decision that an owner is part of the public domain against a local ordinance by which the residents of Calverton, L. I., had sought to restrict traffic into N. Y. International Airport (AW July 5, p. 10). The decision was won by industry elements in seeking through by airport neighbors such as those at Seattle.

The Port of Seattle is still faced with a pending suit filed by 24 property owners north of the field, who ask \$125,000 damages on the grounds that peaceful enjoyment of their homes is disturbed by the noise of planes operating from the field.

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CAA Told To Speed Radar Traffic Control

Washington D.C.—Strong pressure from Civil Aeronautics Administration to develop a radar air traffic control system adequate to handle the rapidly increasing military and civil aircraft load was generated by the Air Coordinating Committee last week.

ACC approved seven recommendations of its Non-Fatal Special Working Group (SWG-13) and indicated CAA to conduct a detailed study on integration of military and defense radar capabilities in a common system of air traffic control.

ACC has set as August 1 deadline for completion of the CAA study in an effort to set criteria on a situation that has been allowed to drift for several years.

Industry sources note increasing pressure on CAA to assume its legal responsibilities for developing and operating a more efficient radar control system to meet the demands of current and future air traffic loads from the military, services, airlines and the top level of the Commerce Department.

These sources predict that if CAA does not meet its August 1 deadline with a positive, workable plan, there will be strong pressure from the military, services to take over CAA's air traffic control function and operation of the federal defense system.

Non Fatal Study

The program adopted by ACC came in the immediate result of an urgent recommendation from its Non-Fatal Special Working Group.

An operational policy group directed to evaluate all phases of the non-fatal system program, SWG-13 re-

initiated an interim report calling for immediate action to ensure a growth of sustainable balance between the steadily increasing demand on the system and operational capabilities.

The report specifically referred to an urgent need to accelerate the program for integration of air defense and air traffic control functions.

It was further suggested that pending an October 1 completion date for the final SWG-13 report ACC would want to set September 1 as a deadline for CAA's evaluation of defense and air traffic control integration. The SWG-13 recommendations were accepted (enough) by ACC except for accelerating CAA's deadline to October 1.

Plan of Action

Most important aspect of the ACC document was placing the problem squarely up to CAA which has the statutory responsibilities for operation of the air traffic control system. In a forthright, unadorned statement, ACC outlined a plan of action that:

- Requires CAA to develop a proposal by the earliest possible legislative session (August 1) for a fast track integration of air defense and air traffic control.
- Establishes August 1, 1955 as the deadline for submission of such a plan which should be as detailed and specific as possible at this time. Limit: Details of the plan is recommended by SWG-13 included the following:

- Develop CAA to handle the radar function.
- Use the Defense arm as the main tactical unit to conduct the system.
- Make the services of ACC's Non-Fatal available to assist CAA in developing an evaluation proposal.

• Have CAA obtain the full coordination and cooperation of the Department of Defense, the Navy, the Air Force and Development Board, and the Lincoln Laboratories.

It was pointedly made clear in the SWG-13 report that there is no intention of a review of the air defense program. Rather, the report pointed only to an effort to bring the common radar system to a traffic control system clear relationship with the air defense system in order to improve the capabilities of each system.

Existence of certain independent activities aimed at radar control in operation was acknowledged, but the report stated the absence of an adequate link with the defense planning program at the Lincoln Laboratories.

The full capabilities of CAA, ANDR, ACC, Department of Defense and the Lincoln Laboratories had not been brought to bear on the problem in a coordinated program.

Other recommendations that will be included in a final SWG-13 report will report these such as a production report (SWG-12) which directed an report on "air traffic control and the national security" in December 1950. This, as based on the fact as true in 1951 as in 1950, that "the air traffic control system has not kept pace with the increased demands on the system."

Priority Problems

Problems requiring priority attention included the need for:

- Expanded use of radar in the common system.
- Continued VTC/ANDR use of air defense radar.
- Wide use of direct pilot to controller communications.
- Segregation of high altitude jet traffic in separate high altitude sectors.
- Expedited transition to a single common system of radar.
- Further development of base radar and the secondary radar beacon system.
- Development of a large scale long-range plotting display for use with long range radar.
- Development of data transfer and display equipment.

Over the years there have been those who maintained that the most promising method and such modern through which the highest degree of efficiency can be attained in air traffic control is a single radar system. CAA spokesmen acknowledge that it is not a new idea but admit this have not been spent into doing in fact, tasks that which "we do make" have taken much longer on the ACC document brings on closer

to action much sooner than we had expected to be."

The outstanding problem among many problems is how to integrate all the radar systems, civil and military, including the Air Defense Command, into one overall system. A suggested plan for integrating the several radar systems in the coming of new radar data is to have CAA air traffic control system and the ADC system. This has posed the question as to whether the merging of new data can be accomplished, and, if so, whether the cost is worth while. The answer to such problems, of course, will only be the beginning.

There is no question that it will require several years and a number of steps to develop an acceptable ADC system that enhances the use of air defense radar. However, ACC has stated that there will be consistent progress toward such an objective.

Sikorsky Offers S-58 For 1956 Delivery

Commercial helicopter operators can place orders for the 12-passenger Sikorsky S-58, with deliveries scheduled to start in mid-1956. The helicopter carrier, a civil version of the Navy's anti-sub S-58, is so popular of Civil Defense Administration, and credit orders is expected to be approved each next year.

The S-58's uses in the airline and industrial field compete with Pacer's recent offering of a 6-12 version of its "transcendental" M-21, designed PH-12 (AW July 4, p. 30). Both craft have been undergoing trials by New York Airways as interim steps pending development of a three-turbine, 30-passenger configuration (AW May 23, p. 28).

Sikorsky spokesman credit the S-58 with a payload of 4,000 lb on distances of up to 100 nautical miles and a cruising speed of over 160 mph. The civilian S-58S-1 has attained 144 mph in level flight during tests (AW May 10, 1954, p. 11). The S-58 will be powered by 1,425-hp engines versus of the Weibull S-58S-1.

Sikorsky expects that about half of each S-58 sales will be to airlines the other half to industrial and utility operators.

Customers will be able to specify color and to store when down.

Cabinet Rejects PAL Stock Purchase Offers

Mail-Pal Air Transport would have been able to purchase a 25% interest in Philippine Air Lines from the government, but has been rejected by President Magsaysay's cabinet. The government



Development Model for YTOL Transport

Experimented YTOL transport model of the National Advisory Committee for Aeronautics Langley Laboratory was shown general views and profiles to provide full information, including and landing. Wings and propellers are conventional position for forward flight. This approach is a development compatible to the experimental Langley YTOL model in which retractable landing gear is data stored without ML, while wings and propellers remained in forward position (AW June 15, p. 30). The experimental model is capable of free flight, normally controlled through the control cable, which also supplies power for the aircraft's electric system.

traveled down the transition using that it found that it would lose its control of the engine. The demands provided despite a accommodations from the National Development Co. that PAA and Civil Aviation Service, PAL president, had agreed to sign varying flying during NDC control. Secondly, the largest individual holder, about 26.25% of the shares.

The Philippine cabinet also rejected an NDC recommendation that PAL's military interests be allowed to purchase 41,150 shares.

Carriers May Lease Navy Cargo Aircraft

The Navy last week offered to lease four cargo transport aircraft to qualified commercial operators as the first step toward introducing an Air Commandant Committee-approved cargo-aircraft leasing program (AW June 15, p. 135).

The rental of Navy planes—two DC-6As and two DC-4s—are being made available—subject to a number of restrictions set down by ACC. Case records operation leasing there must be in the Air Traffic Command, use the planes for cargo operations and provide for maintenance according to CAA and Navy standards. Leases of the DC-6A's will further be required to place: limits for new replacement planes within one year.

Navy will allocate the aircraft to military operations with the advice of the Civil Aeronautics Board. CAB also was requested by Navy in setting the monthly rental rate. A one-year lease of a DC-6A will cost \$252,000 at \$21,400 a month. The dual rate on the DC-4 has not been determined but it is expected to be set at the prevailing market price between \$12,000 and \$15,000 a month. Since 32 airlines, scheduled and non-scheduled, have been approved by Navy as to interest in participating in the cargo-aircraft leasing program.

CAB ORDERS

(June 23 to June 29)

GRANTED

Wing Aviation Limited, a foreign air carrier, served submitting application for transportation of persons and property by means between Canada and points in Western Hemisphere, Ohio and New York, last three years.

Transocean Air Lines, an exemption to surface sea charter flight from Mexico to New York, Kansas to a contract with the International Committee for Transport Migration.

United Air Lines, an exemption to provide free transportation to technical personnel of State Department of Aeronautics for purposes of flight observation and recording of weather, carrying, and equipment on scheduled flights, for one month from July 1, 1955.

Winn Alaska Airlines, an exemption to



Milwaukee's New Air Terminal

Milwaukee will open its new \$12.2 million in terminal building at General Mitchell Field, about 44 mi from downtown, July 22. The building will provide quarters for the seven airlines that serve Milwaukee—American, Capital, Flight Time, North Central, South West, United and United. The new shows its air passenger volume has increased fourteen-fold in the last 10 years, compared with an eight-fold increase for the nation. Milwaukee's investment in General Mitchell Field is now \$16 million.



RANGE UNLIMITED FOR A CUTLASS

Is almost the time it took VX-3 (The Navy's main experimental development squadron) to take this picture during their secret maneuvers, this Chance Vought Cutlass exceeded its range, many hundreds of miles by refueling from its North American AT-18 tanker bombers using the Probe and Dragon system, developed and perfected by Flight Refueling, Inc. The Navy's ability to extend the endurance of fighters changes the whole concept of range and effectiveness of carrier-based aircraft—the real result of years of pioneering in aerial fuel transfer by Flight Refueling, Inc.

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ENGINEERING INTERNATIONAL AIRPORT
Baltimore 3, Maryland

engine is scheduled for installation of power, properly and used because of its low weight and better balance. Also, with its thrust to some 10,000 lb, it is more suitable than the other Fairchild and Pratt & Whitney as a forward propeller on a Pratt & Whitney engine. Also, with its thrust to some 10,000 lb, it is more suitable than the other Fairchild and Pratt & Whitney as a forward propeller on a Pratt & Whitney engine. Also, with its thrust to some 10,000 lb, it is more suitable than the other Fairchild and Pratt & Whitney as a forward propeller on a Pratt & Whitney engine.

APPROVED

Boeing's between carrier carriers adopted by the International Air Transport Association in reference of the status quo with respect to the North Atlantic route after August 15, 1955.

Agreements between Continental Air Lines, Pacific Northwest Airlines and various other carriers relating to intercompany arrangements.

Agreements between Eastern Air Lines, Trans World Airlines and various other carriers relating to intercompany arrangements.

DISMISSED

Investigation and suspension of certain laws filed by Carter Air Transport Ltd., since the fact has been established.

Investigation and suspension of certain laws filed by Great Lakes Airlines since the fact has been established.

General Aeronaut's application for an exemption to perform our marketing field between Portland, Ore. and Vancouver, British Columbia, at the request of the applicant.

DENIED

Northwest Airlines' application to set post service at Kalamazoo, Michigan, as to eliminate Kalamazoo from Northwest's routes.

National Airlines' appeal from orders made to the customer in the Eastern-Central Airports, Inc. National is granted leave to intervene in the case.

Western Airlines' application for an exemption to permit it to provide two times per week direct travel agents for two annual coloration flights.

Southwest Airlines and Eastern Air Lines' application for exemptions to serve certain points in California and Nevada, since the fact is under consideration in the Southwest Airlines case.

Trans-Pacific Airlines' application for an exemption to permit it to provide two times per week direct travel agents for two annual coloration flights.

SHORTLINES

► Air Transport Unit: Approb a passenger facility rate of 25 per 100 (passenger miles in domestic and international operations during the twelve months ending May 1955).

► Newark: Eastern has added Doral-



Boeing engineers have vital and rewarding jobs

This is the Boeing B-52—mightiest of the world's jet bombers. This "super" air all a new breed of the engineers—electric, mechanical, civil and structural—who designed it are now at work on the B-57 fighter development. Many others have gone to work on other "year-ahead" airplanes and guided missiles. But these new Boeing aircraft are classified, and even less known here.

Engineers at Boeing have the satisfaction of vital jobs, where only careful concentration can keep up with ever-growing demands. They stand at the top of their profession—thanks in part to highly advanced equipment like electronic computers, super instruments and research facilities, and the most modern tools and equipment.

Boeing engineers can grow with pride in their development like the B-47 and B-52 jet bombers, the KC-119—America's first jet tanker, and the B-49—America's first jet bomber. These Boeing engineers are now at work on widely diversified projects: rocket, jet and nuclear propulsion, supersonic flight, research in new materials, and more space. The work will be placed and made to work well by even faster, lighter, and lighter, and deliver as ever greater power.

There are evidences of Boeing's engineering growth—a growth made possible by outstanding experience on ever increasing excellence. Boeing employs twice as many engineers now than at the peak of World War II, but even more cap-

acity can be added to Boeing's research, design and production teams.

If you want the satisfaction of doing an important job—if you want an individual responsibility and regular growth—then if you want to work with the latest equipment and the peak of the nation's resources—then it will pay you to investigate career opportunities at Boeing.

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The only turbo-prop airliner in service in the world, the Vickers Viscount has established itself as the most adaptable aircraft of our times. Whatever the climate—tropic, temperate or arctic—whatever the size of competitive problems of the airline for which it flies, the Viscount delivers the same gratifying results. Traffic and load factors rise, operating costs are lowered and profits increase.

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Virtually free from vibration the Viscount creates a new dimension in travel comfort.

Behind the new Viscount stand the great name and service organization of the Vickers Group—internationally famous as makers of ships, industrial machinery, heavy tractors and precision equipment. Capital Airlines will put Viscounts into service between Chicago, Pittsburgh, Washington and Norfolk in July.

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dart on its London-Frankfurt cruise route and has inaugurated service to Bari and Zurich. Düsseldorf is presently served by four flights in each direction weekly.

▶ **Alitalia**, Italian airline, will operate an experimental DC-68 service between Italy and Canada via London and New Zealand this autumn. Permanent service is planned for next year.

▶ **Aeroma**, Venezuelan airline, has started twice weekly service between Miami and Maracaibo with Convair 340 equipment.

▶ **Aeromex**, Colombian National Airways, has added Civil Aeromexicos Boeing to reinforce a stop at San Juan, Puerto Rico, on its Colombia-Europe route. Service through San Juan would be in addition to present service via Barranquilla, Remedios, Lisbon, Madrid, Paris and Frankfurt.

▶ **British European Airways** operated 103 extra flights in the United Kingdom during the recent rail strike. Passenger traffic increased 45%, and BEA carried three times its normal volume of freight and four times its usual volume of mail.

▶ **Cypriot Airways** has inaugurated a weekly air service between Cyprus and Damascus, the first direct air link between the two points.

▶ **Delta Air Lines** reports gross revenue of \$34,127,000 for the 13 months ending May 31, 1955. Net earnings were \$1,701,000, equal to \$2.54 a share.

▶ **International Air Transport Assn.** had during latter business of \$72,075,000 in the first quarter of 1955, a 25% increase over the same 1954 period.

▶ **Japan Air Lines'** summer schedule has three flights weekly on its San Francisco-Honolulu-Tokyo-Hong Kong route.

▶ **KLM Royal Dutch Airlines** carried 128,641 passengers in the first quarter of 1955, a 7% increase over first quarter 1954. Freight traffic was up 15% in the same period.

▶ **Lan**, Italian airline, has started a new service between Rome and Frankfurt via Venice and Munich. Four flights will be operated weekly with Convair equipment.

▶ **Lake Central Airlines** carried 50,396 passengers in May, an increase of 39% over April traffic.

▶ **North Central Airlines** carried 37,891 passengers in May, a 69% increase over the previous May. Load factor rose from 94% to 98% in the same period.



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The All American light weight engine at work at work in a flight testing and all its working.

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The 35 foot x 100 inch model in flight testing in flight conditions and tests up to 30,000 lbs.



The laboratory in the heart of the engine is used in experiments with both hydraulic and electrical drives.

► Northwest Airlines reports its turbo Comstockers have cut one hour and ten minutes from the scheduled time between the Pacific Northwest and Hawaii.

► Pan American World Airways has increased its service between Houston and Mexico City to two flights daily.

► Quebec Express Airways plans to increase daily all-cargo service between Montreal and Boston with Super Constellation and Stratocaster equipment by the end of the year.

► Silver City Airways has opened an air ferry route between Liverpool and Belfast.

► Sudair Airways has inaugurated regular weekly service between Khartoum and Dorset via Cairo.

► Swissair carried 38,411 passengers in May, an increase of 15% over May, 1954. Cargo was up 34% and mail up 21% because has increased 24 sub-Vietnam schedules in two round trips daily.

► Trans-Canada Air Lines will offer 28.5% more seat miles this summer than in the summer of 1954, and 52% more than it offered last winter.

► Trans Caribbean Airways has added two DC-6A and two C-54B aircraft to its fleet bringing the total to four.

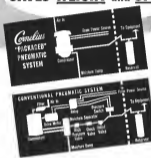
Cuban Airline Chief Plans New Expansion

Herman-Rodriguez expansion and reports of new aircraft on part of the "reconstruction" plan for the Cuban de Aviation, has in interim product Jose Lopez Velazquez.

Velazquez, who has been in "charge of absence" of the airline, was taken over by the Cuban Government's Agrarian and Industrial Development Bank (Banco), enhanced the organization's development of the airline and said it had lost the company over \$15 million. Velazquez, control of the airline was returned to stockholders giving nearly control with the aid of the labor union involved and another government bank.

Airline sources report that the bank has taken over Cubana de Aviacion's obligations to Russia, estimated at \$1 million and the airline have agreed to a 15% wage cut to make up in the form of coupons, stock issued by the union over the next three years. Velazquez has named Juan M. Pardo, former Delta-CASA Airlines public relations auditor, to be vice president/general manager of the Cuban airline.

Cornelius "PACKAGED" PNEUMATIC SYSTEM SAVES WEIGHT and SPACE



★The Cornelius Compressor, Model 130, SCFM, 3000 PSI, is used in the McDonnell F4U-1 and F4U, North American F4U, F4U and F4U, Chance Vought F4U-1, Grumman F4U-1. Also on order for the Lockheed P-38, Grumman S-1 and Martin F4M. Thousands of service hours under all operational conditions is proof of outstanding performance.

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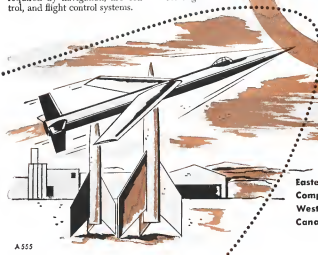
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